THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. V. Nº 101—7th YEAR.] LONDON, SEPTEMBER 2, 1856. [Subscription per Ann. { 15s. in Advance / 18s. Credit.] Price 8d. Unstamped.

FIRE-CLAY Retorts and Fire Goods.
The Advertiser has brought his Fire-Clay Retorts to great perfection, both as to quality and finish. Many have stood three and four years.
Every description of Fire Goods in any quantity always on hand. The Fire Clay is the very best in the North of England. Stock never less than 10,000 tons weathering.
Orders promptly executed.
Apply, G. H. RAMSAY, of Derwenthaugh Fire-Brick Works, near NEWCASTLE-ON-TYNE.
Aug. 22, 1856.

HUDDERSFIELD GAS-WORKS.
MR. WM. BARLOW having resigned the Management of these Works, applications for the Office of MANAGER will be received up to the 1st day of October next.
No person need apply unless he has a thoroughly practical knowledge of the most approved methods of Gas-making in all its departments.
The person elected will be required to find Security.
Applications to be sent—J. C. LAYCOCK, Esq., Solicitor, HUDDERSFIELD.
August 9, 1856.

TO GAS COMPANIES.
P. WAGENMANN and Co.'s GEORGE BITUMEN or CANNEL LIGNITE.—This mineral substance, procured only from the Mines belonging to the above-named Company, is one of the most highly Bituminous Coals known, and peculiarly adapted for the Manufacture of Gas.
Vide JOURNAL OF GAS LIGHTING, August 5, 1856, containing a Communication from Lewis Thompson, Esq., on "The Bituminous Shale of Rhenish Prussia."
The light yielded from a ton of this coal is equal to that from 2141 lbs. of spermaceti, according to Dr. Fyfe's experiments.
For terms and other particulars apply to P. WAGENMANN, Engineer and General Director of the Bonn Mining, Mineral, Oil, and Candle Company, Dierdorf, near NEUVIED, Rhenish Prussia.

SURVEYOR OF GAS-MAINS AND CHIEF INSPECTOR OF LIGHTS.
A Metropolitan Gas Company is in want of a Gentleman to fill the above appointment. It is indispensable that he be a good Draughtsman, of mechanical abilities, good address, and a thorough Man of Business.
A DISTRICT INSPECTOR is likewise required, who must posses similar qualifications to the above.
Apply, by letter only, stating particulars of previous engagements, age, salary expected, and copies of testimonials, to GAS, Watling's Newspaper Office, 400, STRAND.

GAS LIGHTING.
MR. T. A. HEDLEY (A.I.C.E.), CONSULTING GAS ENGINEER, may be consulted upon all matters connected with the manufacture and distribution of gas. Plans, specification, and drawings supplied.—Gas-Works, BANBURY.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOS. COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE.
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire Clay Retorts in the United Kingdom; and orders for Fire Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their works as above.
COWEN'S GARESFIELD COAL AND COKE.
Coal and Coke Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.
JOHN RUSSELL AND CO.,
THE OLD TUBE WORKS,
CHURCH HILL, WEDNESBURY,
STAFFORDSHIRE,
and 69, UPPER THAMES STREET, LONDON,
Original Manufacturers of Wrought-Iron Gas Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.
The eminent Engineer, Mr. Perkins, confines himself altogether to the use of John Russell and Co.'s Tubes in his High-Pressure Steam Patents.
Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.
N.B. All Goods thoroughly Tested before sent out, and Warranted.

WANTED by the Advertiser, a Young Man aged 26, a SITUATION as MANAGER of a GAS-WORK. He for four years held a similar situation to a Provincial Company, whose employ he left to proceed to Calcutta as Assistant-Engineer to the Oriental Gas Company, but has been compelled to return through ill health. Unexceptionable testimonials as to character and ability can be produced. Address, Mr. WILTON, Surrey Street, ARUNDEL, Sussex.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS, NEAR NEWCASTLE-ON-TYNE.
WILLIAM COCHRAN CARR,
begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.
London Agents:
JAMES LAWRIE & CO.,
65, OLD BROAD STREET, CITY, LONDON.

GAS-FITTER.
AN Experienced and Competent FITTER wanted, to whom constant employment and liberal wages will be given. None but men of good character need apply. Address, with reference, &c., to JOHN MIDDLETON, Gas-Fitter, &c., NEWPORT, Monmouthshire.

WANTED, for a Provincial Gas-Work, an Active YOUTH, 16 or 17 years of age, who can write well and understands accounts. His duties will be to assist the Superintendent in the different processes of Gas Manufacture, and to make himself generally useful. Salary to commence at 12s. per week, first year. Apply to Messrs. PADDON and FORD, Gas-Meter Factory, Foundling Terrace, Gray's Inn Lane, LONDON.

TENDERS FOR COALS.
THE Directors of the South Essex GASLIGHT and COKE COMPANY are prepared to receive tenders for the supply of 500 Tons of one of the following Coals:—the BRANSPETH, PELTON, or PELAW MAIN. To be delivered at the r Works at the Lea Bridge Road, Layton, ESSEX.
Tenders, specifying the price of each quality of coal, to be sent to the SECRETARY at the Office, No. 38, Moorgate Street, LONDON, on or before the 10th day of September next. The coals to be delievered in three lots, in September, October, and November.—By order,
CHARLES WEBB COLEMAN, Secretary.
38, Moorgate Street, London, Aug. 27, 1856.

ALFRED PENNY,
ENGINEER,
WENLOCK IRON WORKS,
WHARF ROAD, CITY ROAD, LONDON.
Mr. PENNY begs to inform Gas and Water Companies that he undertakes the erection of new, or the alteration of existing, works; and that he may be consulted generally on all matters connected with gas and water supply. He is also prepared to supply best Cold-blast Retorts, Socket-Pipes, and Connections, Iron Borings, &c. &c., and all the necessary Castings used in Gas and Water-Works.
*** Country orders executed with care and despatch.

JAMES RUSSELL AND SONS,
WEDNESBURY, STAFFORDSHIRE, and 81, UPPER GROUND STREET, BLACKFRIARS, LONDON,
PATENTEES, INVENTORS, AND FIRST MAKERS OF
WROUGHT-IRON GAS TUBING,
commencing from the *earliest* introduction of Gas Lighting into this country.
Manufacturers of every size and description of Wrought-iron Tubes and Fittings, from one-eighth up to seven-inch internal diameter, for Gas, Steam, or Water.
PATENTEES AND MANUFACTURERS OF THE
LAP-WELDED FLUES,
for Marine, Locomotive, and Stationary Boilers.
Inventors and Manufacturers of
IMPROVED STEAM AND GAS COCKS,
in Iron or Gun Metal, from three-eighths to six-inch bore. Manufacturers of every description of hand-screwing
STOCKS, DIES, AND TAPS,
for Gasfitters and Engineering purposes.
Manufacturers of Coils, for hot water and other purposes; Casing of all sizes, with flush joints, for Well-sinkers; Blasting Tubes; Buffer Tubes for Railway Carriages; Tubes for Roller Beams; Spindles, Shafts, Pendulums, Hydraulic Presses, Core Bars, Steam Gauges, &c. &c.
JAMES RUSSELL and SONS beg to call the attention of Engineers, Builders, Water Companies, and others, to their
PATENT ENAMELLED TUBES,
which preserve water or other liquids conveyed by them in a perfectly limpid condition; whilst the Enamel itself is as pure as the finest Porcelain, possessing the rare recommendation of being entirely free from any noxious ingredient in its composition.
Lists, Estimates, &c. &c., forwarded on application; orders, from 10 to 100,000 feet of gas tube, executed at twelve hours' notice if required; and quality may be safely relied upon, as all goods are most carefully tested before leaving the Works.
JAMES RUSSELL and SONS have great pleasure in calling attention to the annexed award:—

"EXHIBITION OF THE INDUSTRY OF ALL NATIONS, NEW YORK.
"Office: No. 6, Charing-cross, London, April 6, 1854.
"Gentlemen,—I have much pleasure in informing you that the Jury has awarded to your firm 'HONOURABLE MENTION FOR LAP-WELDED IRON TUBES.' You are at full liberty, if you deem it likely to promote your mercantile advantage, to affix to these articles, during the season 1854, a card whereon this Award is printed, and also your prices, with name of agent, &c.—I am, gentlemen, your obedient servant,
"JOHN H. BOHN, Secretary.
"Messrs. JAMES RUSSELL and SONS, Wednesbury, STAFFORDSHIRE."

OXIDE OF IRON PURIFICATION.

AN Advertisement, announcing the production by Mr. RICHARD LAMING of a very efficacious Oxide of Iron, as calculated to supersede that now so generally in use, having lately been inserted in the "JOURNAL OF GAS LIGHTING," the undersigned (referring for further particulars to their previous advertisements) hereby give notice, that they will *liberally reward* any one who will furnish them with legal proof of the use of any such Oxides by Mr. Richard Laming, or by any parties under Licence from him. And in regard to Mr. Richard Laming's advertisement in the number of this JOURNAL of August 5, the undersigned desire to state that, until the purchase by them of the whole of Mr. Richard Laming's rights to the use of Oxides of Iron, *Mr. Richard Laming* was *himself* a Licensee under Mr. Hills' patent, whose exclusive rights to the use of Hydrated Oxide of Iron in the purification of Gas he has admitted by Deed, and is still under covenant to support, though he persists in publicly *violating his engagements* in this respect with Mr. Hills, as he has done with the undersigned in bringing forward what he terms his "very efficacious Oxide."

OWEN & MERTENS.

Chemical Works, Mill Wall.

OXIDE OF IRON PURIFICATION—FREE.

EXPARTE Statements, made by persons who threaten me with LEGAL PROCEEDINGS on disputed articles of agreement, concerning which they have signed the following convention, will, in the estimation of the public, be harmless in accusing me of violating engagements:—"If any doubt hereafter exist as to their meaning, or any difficulty occur in carrying any of them out, or if any other difference or dispute arise between the parties hereto with respect to the subject of this agreement, then in either and every such case the parties hereto are severally pledged, ON THEIR HONOUR AS GENTLEMEN, AND ON THEIR INTEGRITY AS MERCHANTS, to submit to the decision which shall be jointly pronounced thereupon by [here are filled in two names, one of a solicitor in partnership with Mr. Mertens, and the other of a merchant, highly respectable and ready to act], or, if need be, by their umpire or referees." (Signed)

W. D. OWEN and HERMAN D. MERTENS.

Messrs. Owen and Mertens *say* I have admitted by deed Mr. Hills' "exclusive rights to the use of hydrated oxide of iron;" I assert that the deed to which they allude records my protest against Mr. Hills' claim to exclude THE PUBLIC from the purification of gas by hydrated oxide. My words in the original draft, afterwards made by Mr. Hills' solicitor, in the engrossed deed, long, obscure, and difficult to quote, are:—"For the purposes of this agreement, *but not in any other manner admitting the same to be a fact*, it shall be assumed that Frank Clark Hills has an exclusive right to hydrated oxide." After being thus careful to discountenance the exclusion of the public, I need hardly deny being under covenant to support Mr. Hills in his exclusive pretensions, as Messrs. Owen and Mertens allege.

I have now to inform gas manufacturers—1. That the specifications of my new revivifiable peroxide of iron, made at a red heat, is filed; and that, as under my patent I claim only the manufacture of that oxide, I have no power to forbid its use: 2. That Messrs. Owen and Mertens have no control over its manufacture by me or my agents anywhere; its sale by me or my agents in Scotland, Ireland, and part of England and Wales; or its use by gas manufacturers in any part of the Kingdom, their right acquired under my patent of 1847 extending only to oxide when mixed with chloride of calcium, or a metallic salt: and, 3. That Mr. Hills has disclaimed the use of my oxide in the following words:—"But I do not claim peroxides of iron made at a red heat." Signed, FRANK CLARK HILLS. From all which it follows that the purification of gas by revivified oxide of iron is FREE.

RICHARD LAMING, M.R.C.S.

118, Fenchurch Street.

MR. WILLIAM RICHARDSON,

CONSULTING ENGINEER,

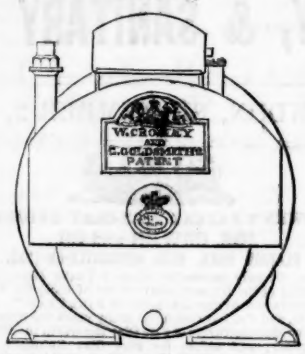
DUDLEY.

CROSLEY & CO.,

GAS METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD,

LONDON,



SOLE LICENCEES AND MANUFACTURERS OF

W. CROSLEY'S AND CROSLEY & GOLDSMITH'S

PATENT STANDARD SELF-ADJUSTING

AND

COMPENSATING GAS METERS,

by which the True Water-Line is constantly maintained, and accuracy of measurement at all times secured.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENTAL METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

C. and Co. continue to manufacture ordinary WET METERS of the very best description, Mr. W. Crosley having been for many years the principal and confidential assistant of his relative, the late Mr. Samuel Crosley, of Cottage Lane, City Road, up to the time of his decease, in which capacity he communicated to W. C. the secret of the mixture of the metals which has rendered the Crosley Meter so durable and superior to all others, as is evidenced by a large number of them being still at work, after having stood the test of nearly a quarter of a century's use.

HARRIS AND PEARSON,

PROPRIETORS OF

BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.

MANUFACTURERS OF

FIRE BRICKS, GAS RETORTS, &C.

AMBLECOTE FIRE CLAY AND BRICK WORKS,

STOURBRIDGE.

Late in the occupation of I. and W. King.

Originally J. Pidcock, Esq.

TO GAS & WATER COMPANIES, ENGINEERS, AND FITTERS.

GARSIDE'S Registered Tube-Vice holds all sizes of Wrought-Iron and Brass Tubes with the greatest firmness and least possible pressure; consequently it is not so liable to split or damage the Tubes as the ordinary Vice, and considerably facilitates the Workman, who may do almost double the quantity of work. Also,

GARSIDE'S IMPROVED MAIN-DRILLING CLIPS, for Drilling Holes for Service-Pipes. With this Instrument the perforation of pipes for the attachment of smaller Tubes can be effected with great ease and precision. Likewise,

HEAP'S REGISTERED GAS TONGS, most highly approved of as vastly superior to those in present use.

For Drawings, Testimonials, and Prices, apply to Mr. G. JAQUES, 3, Gloucester Road North, REGENT'S PARK, Sole Agent in London; or to the Maker, S. GARSIDE, Stamford Street, ASHTON-UNDER-LYNE.

NOTICE.—INFRINGEMENT OF PATENT.

CRICKMER'S Patent Metallic Packing for Steam-Engines, Pistons, Piston-Rod Stuffing-Boxes, Pumps, &c.—Notice is hereby given that a perpetual Injunction of the High Court of Chancery has been obtained by Messrs. OASTLER and PALMER, trading under the Firm of ALEX. ROSS and CO., Grange Mills, Bermondsey, against Messrs. LITTLE and CHAMBERS, of Manchester, to restrain them from further infringing the above Patent; and that the above Packing can only be obtained of Messrs. ALEX. ROSS and CO., Grange Mills, Bermondsey, LONDON (the Proprietors of the Patent), or by their authorised Agents.

Mill Bands, Hose Pipes, and Fire Buckets made to order from the best-selected Oak-Bark Tanned Leather.

Prices Current to be had on application.

WILLIAM STEPHENSON & SON,

THROCKLEY,

NEWCASTLE-ON-TYNE,

MANUFACTURERS OF EVERY DESCRIPTION OF

FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,

&c. &c.

LONDON OFFICES:

76, KING WILLIAM STREET, CITY.

STATION-METER.

TO be Sold, a Station-meter, constructed by Edge, of Westminster, capable of passing from 4000 to 5000 cubic feet per hour, together with the Back Pass.

The Meter is in good condition, and is to be sold by reason of its being too small for the present requirements of the Works.

Apply to Mr. W. C. WOOD, High Street, DUDLEY.

J. W. & J. CHANDLER,

LATE

BEVERIDGE, HEDLEY, & CHANDLER,

ENGINEERS, MILLWRIGHTS,

IRON AND BRASS FOUNDERS, &c.,

MANUFACTURERS OF ALL DESCRIPTIONS OF GAS AND WATER-WORKS' APPARATUS,

AND PIPE-TESTING MACHINES,

NELSON FOUNDRY,

PRESTON.

N.B.—A stock of Pipes always on hand, from 1½ inch and upwards.

J. CLIFF'S

FIRE-BRICK WHARF,

No. 4, GREAT NORTHERN GOODS' STATION, LONDON.

WORTLEY { FIRE-BRICKS, CLAY RETORTS, LUMPS, AND GUARDS.

A Large and Assorted Stock always kept on hand at the above Wharf.

Orders for London and South of England to be addressed to MARCUS B. NEWTON, Agent for the District, No. 14, South Street, Finsbury Square, LONDON.

READY AND MEYNELL,

BRASS FOUNDERS AND GAS FITTING MANUFACTURERS,

BILSTON STREET, WOLVERHAMPTON,

Beg to call the attention of English and Foreign Gas Companies, Gasfitters, and the Trade generally, to their extensive stock of the undermentioned articles, which are kept constantly in stock, viz.:—

EVERY VARIETY OF

GAS CHANDELIERS,

HALL LANTERNS, BRACKETS, PENDANTS, AND PILLARS OF THE NEWEST DESIGNS;

WROUGHT-IRON GAS TUBING,

And every description and size of IRON and BRASS FITTINGS, for GAS, STEAM, or WATER.

Architects and others are requested to inspect the beautiful Specimens of MEDIÆVAL CHURCH GAS-FITTINGS, designs of which will be forwarded to order.

STEAM, WATER, AND SANITARY APPARATUS, OF EVERY DESCRIPTION.

Illustrated Price Lists, containing estimates for every description of Chandeliers, Gas-fittings, Cocks, Valves, Pumps, &c., may be had on application at the

MANUFACTORY, BILSTON STREET,

WOLVERHAMPTON.

CONTENTS.

PAGE

Leading Articles :—
Notes on Passing Events 491
On the Results of some Recent Borings for Water 492
On the Report of the Committee on the Adulteration of Food, &c. .. 493
On the Recent Inundations in France 494
Circular to Gas Companies 496
Communicated Articles :—
Observations on the Mode of Ascertaining the Standard of Gas .. 497
Register of New Patents :—
Hyams' Improvements in the Construction of Gas-Meters 498
Savory's Improvements in Apparatus for the Passage of Water, &c... 498
Laming's Improvements in Purifying Gas 498
Clibrans' Improvements in Apparatus for Measuring Gas 498
Kersey's Improvement in the Manufacture of Drain-pipes 499
Fonbonne's Improved Apparatus for the Manufacture of Coke, &c. .. 499
Provisional Protections 499
Notices of Intention to Proceed 499
Miscellaneous News :—
The Metropolitan Board of Works.. 499
Evidence of Lewis Thompson, Esq., before the Parliamentary Committee on the Adulteration of Food 500
Meeting of the Phœnix Gaslight and Coke Company 505
Meeting of the Wolverhampton Gas Company 507
Improved Mode of Iron Smelting 508
Liverpool 509
Dorchester 509
Madrid 509
Price Current 509

NOTICES.

The next number will be published on Tuesday, Sept. 16, and the subsequent numbers on each successive alternate Tuesday, till our project of weekly publication is carried into effect.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 3, Parliament Street, Westminster; and orders for Advertisements to Mr. W. B. King, the Publisher, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 2, 1856.

NOTES UPON PASSING EVENTS.

In the present stagnation of political, financial, and industrial matters, it may be worth while again to call the serious attention of our readers to the result of the great experiment of local self-government in London, obtained during the past session, and to the probable results it may produce if allowed to develope itself to its natural consequences. We use this last expression advisedly, because it is tolerably well known that the present Socialist Government is dissatisfied with the conduct of the representatives of the ratepayers; and, moreover, it is generally believed that it is contemplated to return as soon as possible to the old system of nominee-commissions, in matters connected with the public works of the metropolis. Indeed, the Metropolitan Board of Works has exhibited so much independence, and has so distinctly refused to receive the officers sought to be imposed upon it by the mischievous theorists in power—it has so honestly declined to make itself the electioneering agent of any parties, or to receive the nominees of parties who ought never to have intermeddled in such matters—that it is hardly probable that our present rulers should tolerate a power so little disposed to accept their control. If it depended upon the authors of the "Metropolis Bill, 1855," then we believe that its fate would soon be sealed; but that measure affirms a principle of such extraordinary social importance, that it can only be abrogated by a course of action which would endanger the most valued liberties of the country. Therefore it is that we endeavour to warn the public of the metropolis of the danger to which they are exposed, and to rouse a jealous watchfulness for the defence of an act which—however defective it may be, containing as it does the principle of popular control—will in the end provide the remedy for its own shortcomings; and, even let its working be ever so bad, will morally be preferable to any administrative centralization. We must not disguise from ourselves, in fact, that the great struggle which is now taking place amongst us lies precisely between the principles of local self-government on the one side, and of central despotism on the other; and that much of the future conduct of such men as Lord Palmerston and Sir B. Hall will depend upon the resolution the inhabitants of the metropolis may display in defence of the municipal liberties they already possess.

The result of the experiment hitherto tried has been, unfortunately, of what may be called a negative character; and to some extent it would seem that it justifies the complaints which have been uttered against the conduct of the Metropolitan Board of Works. There has been a great deal of talking, and, so far as the purification of the Thames is concerned, we are apparently as far from a solution as ever. There has been much absurd interference with the operations of private builders by the officials of the Metropolitan Board, and it would appear as though they really were armed with power to re-enact the jobbery and corruption with which Sir B. Hall so bitterly reproached the General Board of Health. We look in vain for the positive good hitherto effected by the new Municipal Council; and although, no doubt, there are amongst its members many able, energetic men of business, yet the debates of the general body, and the proceedings of the various committees, have been characterised by a want of firmness and decision, and by an absence of purpose, which cause us to argue ill for their future proceedings so long as the board is composed of its present members. It may be that the enormous magnitude of the problem submitted to their decision may justify the hesitation of their conduct; for, although it is easy enough to say that the Thames ought to be purified within a certain number of years, it is quite another thing to do it. "Fools rush in where angels fear to tread;" and we have seen already, in such cases as Southampton, the danger of hastily attempting to apply official theories, or of assuming that they are even founded on facts. It was necessary for the new Metropolitan Board to investigate the whole question of the sewerage of this huge city *de novo*, and a few months' delay may well be tolerated, if it should only have secured us from a repetition of the fearful blunders of government officials in other places. As it is, we ourselves believe that the delay which has taken place will be productive of good in another respect, viz., that it has afforded time for the discussion of various systems of disinfection of the sewerage matters, which the public was disposed to ignore in its haste to urge forward the great intercepting sewers. It cannot be too often repeated, that, as we already observed in our number for February 19, and of August 5, the bulk of the alluvial matters in the whole of the tidal part of the Thames must be brought in from the sea; and that therefore the continuation of the intercepting sewer to Sea Reach, or even to the Nore, would in nowise prevent the return of the sewerage to the metropolis. We advocated the execution of the intercepting sewer to Plumstead Marshes, because we believed, that even if no efficient mode of disinfection were adopted, that point was sufficiently remote from the densely-peopled portions of the town to allow the sewerage there to be poured into the "allaying Thames," without danger to the public health; but, at the same time, we have always felt convinced that long before the intercepting sewers could be completed, the great problem of disinfecting the matters it contains, will meet with a more satisfactory solution than we already possess. The difficulty and delay hitherto attached to the execution of Mr. Bazalgette's plans will force this subject still more upon the attention of the scientific world; and, as no plans can now be adopted which have not been discussed and approved by the representatives of the ratepayers, it will be the fault of the ratepayers themselves if they do not compel their representatives to act with greater judgment than government boards have done in these matters.

Perhaps one of the greatest dangers attached to the operation of the Metropolitan Board of Health lies in the designedly imperfect nature of its electoral system, and in the partial renewal of its members. If the board were directly elected by the ratepayers, instead of being elected by the vestries; and if they were obliged to present themselves to their constituents once a year, instead of once every three years (as is now substantially the case), the sense of direct responsibility would operate more effectually than it can do at present. As it is, public opinion has great influence upon the Metropolitan Board, and has corrected the intentional defects of its organisation. So long as its proceedings are jealously watched by the ratepayers, its power and influence will be supported by the very agent which may at times seem to thwart some of its proceedings; and if the members of the board felt the importance

and the strength of their position, they would be enabled to act more independently of the would-be Minister of Public Works than they have hitherto done. There have been hesitations, there may have been short comings, in the proceedings of the Metropolitan Board of Works hitherto; but it is certain that they have at least maintained the works under their charge as well as the former commissioners did, and that they have avoided rushing into the unwarranted nonsense of government *protégées*. The future will, we are convinced, enable this body to act with greater decision. At any rate, as the board is indirectly subject to popular election, it will be, as we said above, to a great extent, the fault of the ratepayers if they do not exclude, at the next partial election, those of its members who have proved themselves unfitted for their posts.

There has been a great "palaver" between Sir B. Hall and the leading architects, for the purpose of settling the terms of a competition for the new government offices, in which the First Commissioner seems to have have acted the part of all those who seek advice after having previously formed a resolution. We are, as a nation, singularly unfortunate in these matters of art encouragement; and the reign of Sir B. Hall does not seem likely to secure more satisfactory results than those of his predecessors. In the case of the alterations of Westminister, for instance, it would appear that Sir Benjamin has resolved, in spite of the *Times* and of Mr. Doulton's meeting, to throw away all the money already expended upon Westminster Bridge, and to change the direction of the whole traffic of this part of London. He now invites a competition of all the world for plans for the distribution of a series of buildings to cover the whole space between Downing Street and Richmond Terrace on one side, and Great George Street and Bridge Street on the other, and extending between the river and St. James's Park. Yet, whilst inviting to this competition, he avowed that he did not know what buildings he required, nor would he furnish any clue to the mode of appropriation of the ground which would be considered advisable. So all the architects of the world are to waste their time in designing sets of buildings, with respect to which they have little other information than that they are to stand upon a certain area! Then, again, the professional adviser of the First Commissioner seems to have set his face against "bird's-eye" views, as though it were possible to judge of the effect of suc an immense mass of building as it is proposed to erect here by any partial elevations! It was asked, who were to constitute the tribunal to decide upon the merits of the various plans? and really we can understand the indisposition of men of acknowledged talent and position to risk their time and money without a much better security than they have at present of the competence—to say nothing of the fairness—of those who are to decide upon the merits of their works. It appears, however, that the juggle of estimates is to be excluded from this competition, and we cordially approve such a deviation from the course adopted in the previous competition for the Houses of Parliament; in this respect, experience has made even the Board of Works wise. Nevertheless, as it is certain that the operations contemplated at Westminster must eventually cost at least £3,000,000 or £4,000,000, we invite the attention of country constituencies to this outlay for the embellishment of London. Are we about to enter upon the continental folly of adorning the capital at the expense of the provinces, which is only another mode of administrative centralization?

The Institute of British Architects and Mr. Wilson appear to have carried on a correspondence upon the subject of Sir C. Barry's remuneration, in which the first-named party has managed to place itself in a supremely ridiculous position, and to have drawn from Mr. Wilson a well-merited rebuke. Sir C. Barry made, either knowingly or ignorantly, a foolish bargain with the Treasury; and the Institute, with a creditable fellow-feeling, no doubt, thought fit to record its protest against the precedent thus created, and to endeavour to secure a revision of the agreement. Mr. Wilson, we think, very properly replied, that Sir C. Barry was the person really to blame in the matter, if a dangerous precedent had been established; and whilst in polite terms telling the Institute to mind its own business, he said that the Lords of the Treasury "felt that the Institute might with greater propriety call upon a member of its own body for an explanation of the motives by which he was governed (in making the arrangement of 1839), rather than address a remonstrance to Her Majesty's Government against the deviation acquiesced in by him in 1839, from the rate of charge recognised by the profession." It is always dangerous thus "to thrust one's finger between the bark and the rind:" the Institute had the worst grace to interfere in a money quarrel, and it has received a "snub" it richly merited.

The Registrar-General has given another illustration of his mania for interfering with matters which do not concern him, and of the annoyances to which we may be exposed if some check be not placed upon the continually extending intervention of government functionaries with our daily habits. Not content with the ridiculous Smoke Abatement Bill, as applied to factories, he now displays the wish to see its provisions extended to private houses; so that we may shortly expect an act to compel us at least to light our fires from the top, even if we be not compelled to replace all our grates by Arnott's grates! Where is all this interference to stop? We cannot be born, die, or get married, without the cognisance of this busybody in the Registrar General's Office. We are subject to government inspection in our dust-bins and water-closets in many towns, and will, no doubt, be so in all, at some proximate period. We are to have government assays of food, if the hungry office-seekers carry their point; and now we are menaced with inspectors of fireplaces. Truly a parental Government is a glorious invention for place-making and jobbery! As for the good it does, we refer our readers to M. de Tocqueville's "*L'Ancien Régime et la Révolution*," in which they will see that the interference of the State in the details of life must lead to the destruction of individual strength of character, and eventually to the establishment of a system of equality under a despotism. It is odd how these questions of municipal law connect themselves with general politics, and how hard it is at times to avoid reference to the latter class of considerations.

In the scientific world, the same degree of apathy which appears to prevail in politics does not exhibit itself; and we would call the attention of our readers, amongst other recent publications, to the wonderful Maps of the Stars, by M. Cachornac, which appear likely to render extraordinary service to astronomy, even if they may not already be considered to have done so, by the aid they have afforded for the discovery of the small planets. This is no new enterprise, for the Berlin maps date from some years ago, and there have been many labourers in the field since then, such as Messrs. Valz, Cauchy, Le Verrier, Hind, Bishop, Cooper, Graham; but M. Cachornac's maps are the most complete yet published; and, indeed, in the six sheets of the ecliptical maps there are figured no less than 125,000 stars. Descending from this sublime elevation, we may turn to Mr. Mylne's Geological Map of London,—a document of extraordinary research and skill, and of inestimable value for purposes of scientific inquiry in engineering or sanitary matters; or to Sir R. Murchison's beautiful map of the Western World; both which documents must possess, in the opinion of the scientific inquirer, an additional interest from the assistance they offer in the study of M. d'Archiac's wonderful "*Histoire des Progrès de la Géologie*." In the "*Comptes Rendus de l'Académie des Sciences*," for 21st July, 1856, there is also a notice to which attention may now be called, in consequence of the accidents in some of our coal-mines. It is a memoir by Mr. T. Dobson, though of course in French, upon the connection between the explosions of fire-damp in collieries, and the occurrence of circular hurricanes; and in it the author shows the necessity for consulting the barometer as frequently in fiery mines as at sea. We shall return to these subjects hereafter.

The Artesian boring at Passy, to which we before alluded, has been carried to a depth of 1432 feet from the surface, and is now brought temporarily to a stand-still by the breaking of a tool in the bore.

In addition to the ravages of the cholera at Madeira and at Lisbon, it appears from the correspondence of *Le Nord*, of August 27th, that the fell disease has made its appearance at Paris, although the parental Government of that country has not allowed the fact to transpire. The number of cases has not been great, and they have been confined to the lowest and the most depraved classes of society.

ON THE RESULTS OF SOME RECENT BORINGS FOR WATER.

In our number for July 22 we called attention to the occurrence of a bed of red clay, containing fragments of new red sandstone, at a short distance from the surface, at Warnham Court, about 1½ mile N.W. of Horsham. Nothing further has been done in this matter, nor have any attempts been

made to ascertain the precise nature of this clay; for the numerous failures which have taken place in the attempts to discover coal in Sussex have naturally indisposed landed proprietors to lay out their money upon an experiment which, after all, must be considered extremely problematical in its results. But it may be worth while to remark, that the possibility of the correspondence of the anticlinal line of the Weald, with an upheaval of the more ancient rocks, is confirmed, to some extent, by the fact that the former is situated as nearly as possible upon a line drawn from Calais, where the last traces of the Belgian carboniferous series occur on the continent, through the ridge separating the watersheds of the streams flowing into the Thames from those of the streams flowing into the British Channel, thence through the Somersetshire, the south Wales, and the south-west Irish coal-fields. The parallelism of the South Downs with this supposed line of upheaval is also worthy of note; and, though the same remark may not apply to the North Downs, which bend rather towards the north-east of the direction to which we refer, their change of direction may possibly be accounted for by the supposition that some inequality in the force of upheaval took place; and this again may serve to explain the difference of level observable in the red clay beds discovered at Highgate and at Warnham Court. Altogether, this question is now in a very interesting and, so to speak, provoking state. At no point could it be more satisfactorily solved than near Horsham, for that town is situated immediately upon the anticlinal line of the Weald, and at one of the heads of the strike of the strata.

If this opinion of the existence of a great line of displacement and upheaval should be confirmed by further observation, it must not, however, be hastily assumed that such a phenomenon in any way invalidates the received laws of geology. It only proves, at most, that those laws cannot serve to enable us to assert, *à priori*, the conditions we *shall* find to prevail at great depths from the surface: they still hold true as to what we shall *not* find. Oddly enough, also, at the precise period when an unexpected occurrence appears to cast doubts upon the correctness of the received science of geology, a remarkable, and perhaps a most inappreciably important, confirmation has been afforded in a country where it could least have been expected; for an artesian boring has lately been executed with remarkable success upon the margin of the Desert of Sahara; thus at the same time proving the correctness of the opinions entertained by geologists of the nature of the subsoil of that district, and rendering possible the introduction of European civilisation into the interior of the African continent through Algeria. What strange events sometimes depend on little causes! If the Dey of Algiers had not struck the French consul a blow with a fan, that enterprising race might never have been induced thus to carry the benefits of its science and practical energy into the regions where they are so much required, and are so likely to advance the happiness of humanity.

These remarks were forced upon us by reading a letter from M. Rozet to M. Elie de Beaumont, in the *Comptes Rendu de l'Académie des Sciences* for June 30, 1856. In it M. Rozet recalls to the recollection of the illustrious secretary of the Academy that as far back as 1830 he had arrived at the conclusion that the soil of the Sahara was composed of the sands of the sub-Atlantic formations; and that in 1832 he had published a note (in vol. ii. of the *Nouvelles Annales du Muséum d'Histoire Naturelle*) in which he stated his opinions as follows: "I think, from the mode of formation of the tertiary series by basins and upon the shores, from the great development of this series on the north and south of the small Atlas, and from the information given me by M. René Caillé, that I am justified in saying that this series constitutes the soil of the great Desert of the Sahara. The sandstones and tertiary limestones are there to be found in horizontal strata, and covered by a great mass of sands, which are the same as those found in the upper parts of the sub-Atlantic formations; only upon the south of the Atlas they have assumed an extraordinary development. As the argillaceous marl, which would most likely be found at the bottom of the tertiary formations in the Sahara, as also between the Atlas chains, retains water, it is possible that, by sinking to a certain depth, abundant supplies might be discovered: bored wells, perhaps, might be established. These would be of great importance for this barren country, and for the caravans which are obliged to traverse it."

"Twenty-six years after these views had been announced," M. Rozet goes on to observe, "they have been confirmed; for the *Moniteur* of June 25 contains a report from General Desvaux, commanding the sub-division of Batna to the Governor-General of Algeria, in which he states that, 'on the 9th of June, at three o'clock P.M., the water rose to the surface at the boring of Tamerna, in the Sahara. The depth of the well is about 197 feet, and it yields about 792 gallons per minute, or 1,140,480 gallons per day. This fact,' continues the General, 'proves, more than anything which can be said, the great progress made of late years in Algeria; and this promises, within a few years, transformations of the most wonderful description.'"

M. Rozet adds, that when, in 1852, he was employed in some geodesical operations in the Roman States, he was led to believe, from the presence of the same tertiary strata as he had noticed at Algeria, at the southern foot of the Appenine, that artesian (or bored) wells could be sunk in the zone comprised between that chain of mountains and the Mediterranean. He proposed at that time to General Gemeaux to send to France for a set of boring tools, in order to make an experiment near Civita-Vecchia, where there is a great deficiency of pure water, but no attention was paid to the suggestion. Nevertheless, M. Rozet still believes that it would be easy to obtain water in this manner in the sub-Appenine district between Rome and Tuscany. Does not the question also arise, whether the law found to hold good in the Sahara may not also prevail in other deserts as dry and barren as it is? In Egypt, Ayme Bey has already proved that water is to be found under the sands by means of artesian wells; and it is possible that the discovery of such sources of water supply in Syria and Arabia might again bring into importance the routes formerly traversed by the trade between Europe and India. The deserts, too, of north-eastern India might also be rendered more accessible, were they found to possess these subterranean reservoirs; nor is it improbable that the laws which regulate the flow of underground waters may hereafter be found to provide a remedy for the droughts of Australia. In this case, as in all others, it is impossible to say what may be the ultimate effects of the successful application of a natural law, even in cases where there is little apparent analogy between the external phenomena. At any rate, the successful results of the boring at Tamerna, the failures at Calais and at Highgate, together with the assumed recurrence of the irregularity in the order of the strata at Horsham, prove that the science of geology may still expect great assistance from the discoveries to be made in the search for water by well-borers.

A very interesting, though it must be confessed a rather wordy, book has lately been published in Paris by the Abbé Paramelle, called "*L'Art de Découvrir les Sources*." It appears to us that it is of sufficient importance to call for a detailed notice, and we therefore propose to make it the subject of a communicated article in one of our early numbers; but it is strange that it should only be in the year of grace 1856 that an attempt should be made to discover the principles of such an art.

ON THE REPORT OF THE COMMITTEE ON THE ADULTERATION OF FOOD, ETC.

THE trading character of Great Britain has been put on its trial, and the verdict now lies before us in the shape of a goodly "Blue Book," weighing, as the cover informs, something "under three pounds," but really heavy enough to sink the reputation of all England. Well, we have been tried and found wanting. The result (Heaven mend us!) is, that we are all rogues together, and can only be prevented from cheating each other into the grave by acts of Parliament, kept in motion through commissioners, inspectors, testers, &c., who of course require to be well paid for taking care of us. The honesty of England is all sham, or, if ever there was such a thing, it must have been when the inhabitants lived on acorns and drank nothing but water. Poor Jack Falstaff found "lime in his sack," and it is the same still—"there's nothing but villainy in the world;" everything is false and sophisticated, except only "blue-books and Parliamentary committees," which are fortunately pure and unadulterated even with common sense.

Seriously speaking, however, this blue-book is one of the most detestable evidences we have yet seen of that determined spirit of jobbery and individual corruption which pervades the present House of Commons, and, under the guise of seeking the interest of "the poor man," really hunts after nothing but

personal place and power. "The poor man" actually cared for in every instance of this kind is no other than the poor member himself, and a batch of hungry supporters, all greedily anxious for a dip into the public purse. We have watched this matter with some care, and trust ere long to see the eyes of the public opened to the true meaning of the expression, "Poor man," as pretended to be applied to the well-paid and thriving labouring population of this country. But the fact is, there exists an undisguisable disposition on the part of the present Government to lend itself to any scheme for increasing its patronage and enlarging its powers of corruption. Lord Palmerston's favourite hobby is a "strong Government," which is the smooth name for an executive with a well-bribed majority in the House of Commons, capable at any moment of enjoying his lordship's witticisms, and laughing at the mismanagement of the country. It happens, however, that his lordship has just now very little else than jokes to give, and his would-be supporters want well-paid berths. How is this difficulty to be got over with a fast-diminishing excise and an increasing hatred on the part of the people to that and all similar encumbrances? "Oh!" says Palmerston, "imitate Louis Napoleon; have a go at the *bourgeois*, and pretend it is for the interest of the 'poor man;' get up a misunderstanding between the shopkeepers and the working-classes, and, like Iago—honest, honest Iago "do it all for pure love of your victim."

Now, we really care but little for this governmental disposition to encourage jobbery; though dangerous, it is not necessarily fatal to the existence of true liberty; but, when we see a considerable number of the very men who ought to seek the extension of that liberty banded together for its restraint, and anxious to fetter the trading freedom of the country, with a view merely to secure place and profit for themselves and their assistants, we involuntarily sigh for the fox-hunting Parliaments of William Pitt, rather than the place-hunting members of the present House of Commons.

Of the report now before us we must say that, so far as the committee is concerned, nothing more disgraceful could possibly have been published; the whole affair displays the most gross onesidedness, and it would have been infinitely more in keeping with the obvious intention of the inquiry, had the committee advertised for witnesses to prove that our shopkeepers were all knaves, than to have sat listening with pretended impartiality to information which they totally disregarded whenever it was unsuited to their purpose. The object glaringly displayed by the committee was to get up a case "*per fas et nefas*," and perhaps at no period of our history has a similiar mass of overdone testimony ever been adduced: a foregone conclusion has tinted everything of its own jaundiced hue, and marked with manifest impatience and irritability the reception of any evidence tending to show that, as a nation, we had long gone on taking care of ourselves with the most satisfactory result, and wanted no governmental go-cart to stilt us up into a continental insecurity. When, on the contrary, evidence of an opposite character was offered, its reception was marked by applause and wreathed smiles from every quarter, which stand visibly imprinted in the report; and, no matter how dubious the nature of the testimony, it was swallowed with importunate avidity. Thus, Mr. Robert Gray, who admitted that he "had done as much in the way of adulteration as any man in the trade," was, nevertheless, put on the most favourable footing with regard to the truthfulness of his evidence; like the retired Quaker, this gentleman had found that "honesty was the best policy, for he had tried *both*." Having done "as much as any man" to cheat the public, and having failed to make a living at it, Mr. Gray has become virtuously honest, and will no doubt continue so for his own sake; but we cannot so readily credit his evidence as that of an individual of less culpable experience; nor, in our opinion, ought the committee to have done so, either in this case or in several others which present themselves throughout the report.

Upon the whole, however, the evidence is anything but favourable to legislative interference; and even Mr. Postgate, who claims the merit, through Mr. Scholefield, of getting up this outcry, was quite unable to answer the inquiry of Mr. Wise, "If the public prosecutor brought a charge against an individual, and that charge could not be proved satisfactorily, how would the unfortunate individual get his expenses?" Mr. Postgate "scarcely knew what reply to make to that question!!" And this was precisely the point upon which the evidence of our well-known correspondent, Mr. Lewis Thompson, turned; and it is on account of the unanswerable nature of this argument that he has been so venomously assailed by the hireling portion of the press. We publish elsewhere Mr. Thompson's evidence in full, and also a letter which he lately addressed to the editor of the *Times* through the columns of the *Daily News;* for incredible as it may seem, the editor of the *Times*, after slurring over that evidence, and publishing an attack upon it from Dr. Hassall, had the cowardice to refuse insertion to a reply, which will, nevertheless, long offer a formidable resistance to the encroachments of the adulteration place-hunters.

The fact is, that the trading community of this country must now, however, begin to work for themselves, and guard their own interests: they must combine together, and tell a time-serving Government that imputations upon the national character are not to be tolerated merely because it suits the purpose of the hour to create a spurious patronage with which to endow the mere refuse of society. If patronage be necessary, there is an abundant field open in the favourite direction of "the poor man:" teach him, instruct him, and inform him how he may himself acquire the means of self-protection: this will elevate his character, and enable him to set adulteration of every kind at defiance—ay, even Parliamentary adulteration! Instead of commissioners, inspectors, and testers, let instructors and teachers be appointed to explain the nature and general properties of the various substances that pass through the hands of the labouring man, whether in the shape of food or clothing, or fabricated matter. The mere mechanical operations of reading and writing are nothing but phantoms, if unaccompanied by substantial knowledge; and the minister who shall first bring into actual use a system of diffusing through the working classes a true acquaintance with the materials they daily encounter, will have done more for the advancement of his country than 10,000 jobbing schemers could effect, though they each lived to the age of Methusalem. Away with stilts, props, and crutches; let the labouring man walk in the strength of knowledge.

ON THE RECENT INUNDATIONS IN FRANCE.

The periodical recurrence—and apparently at much closer intervals than formerly—of the fearful inundations of the great watercourses of France entails such an amount of suffering and pecuniary loss that, even in an English practical journal, the conditions affecting these scourges may be consistently examined, especially as our own country has at times suffered from similar accidents. Naturally enough, our neighbours have been violently excited by the calamities which took place under their eyes, and every one, from the Emperor himself to the editors of the smallest local newspapers, seems to have felt bound to suggest his opinion as to the cause of, and remedies for, the evil. The multitude of counsellors does not always bring wisdom; and hitherto the publications which have issued from the French press cannot be considered to disprove our opinion as to the doubtful character of the proverb: but the discussion shows, at least, that the boasted State organisation of public works amongst our neighbours has been very far indeed from protecting them from evils which might have been guarded against, even if the authors of the course of proceeding adopted by the administration of public works be not responsible for the aggravation of the evil naturally occurring.

The peculiar configuration of the soil of France exposes it at all times to inundations, from which England is, comparatively speaking, free; on account of the greater number and importance of the mountain chains of the former, some of which even are sufficiently elevated to be always covered with snow. A general description of the orography of France may be given by stating, that it is bounded on the south by the lofty ridge of the Pyrenees, with a general direction from E. to W., and presenting a gradual slope towards the northern or French side. From about the first parallel of longitude west of Paris, this northern slope of the Pyrenees is intersected by a ridge trending towards the N. by E., which forms the division line between the water-sheds of the Adour and the Garonne on the west, and of the Aude on the east; and, after following this direction for a short distance, the cross ridge assumes the character of a mountain chain, and is continued nearly throughout the length of France by the ridges ordinarily known under the names of the Cevennes, the Vivarais, the Charrolais, and the Côte d'Or; at the extremity of which it turns abruptly, and for a short distance to the S. W., through the Plateau de Langres, and resumes its northerly direction in the chain of the Vosges. Parallel to this chain, towards the

west, are situated the minor ridges of the Auvergne and of the Ardèche; from the former of which flow the rivers Lot and Dordogne, tributaries of the Garonne in the lower part of its course; and perhaps the Charente and the Vendée may be considered to form part of this hydrographical division, inasmuch as they are fed by a spur running with a N.W. direction through the department of La Vendée. From the latter, or the Ardèche range, flow the Loire, the Cher, the Allier, the Bebre, and the numerous affluents of the Loire, which, moreover, in the lower part of its course receives the countless streams flowing from the northern slope of the Auvergne chain, and from the western slopes of the Côte d'Or and of the Charrolais, as well as those flowing from the southern slope of a ridge—to be hereafter noticed—running from east to west through Châtres, Alençon, Mayenne, and the Côtes du Nord. There is a rather more complicated, but still sensibly parallel, chain to the main one before noticed, which bounds the valley of the Rhone on its eastern side; and, although its main direction bends abruptly towards the N. E., through the Alps, from a point near Lyon, it is continued by the Jura, and this, joining the mountains of the Black Forest, may be considered to continue onwards to the German Ocean. The cross chain of the Côtes du Nord appears by its upheaval to have given rise to the various watercourses flowing into the Channel, and to have communicated to the whole of the north of France a general slope towards the north; and, as its axis is situated at a slight distance from the sea-coast, the various rivers flowing from it are rarely of any length or volume worthy of notice, with the exception perhaps of the Seine, which, after all, may be considered to derive the bulk of its waters from the north-western slopes of the principal chain, and of the plateau situated at the intersection of the northerly and of the easterly ridges. It may be worthy of remark, that the main directions of the Pyrenees, and of the mountains of the Côtes du Nord, are parallel to the principal ridges in the south of England and Ireland; whilst the great meridinal lines of the French mountains correspond generally with the axes of the Welch and of the western Highlands of Scotland.

Of these French chains, the Pyrennees have a mean height of about 9500 feet amongst the mountains near the sources of the Aude, whilst the mean height of the boundary of the water-sheds of the streams flowing into the Bay of Biscay and into the Mediterrenean is about 8800 feet. The mountains of the Cevennes in no case exceed 5635 feet in height, and they have much more gentle slopes towards the north than towards the east and south. The mountains of the Auvergne have a mean height of about 2300 feet, rarely attaining 5300; which may also be considered to represent the conditions of the mountains of the Vivarais and of the Ardèche. The mountains of the Charrolais do not exceed 4756 feet, but the mean height of their summits is about 2600 feet; whilst the mean height of the vast Plateau de Langres is about 1350 feet, reaching in some places to nearly 1900 feet. The mean elevation of the summits of the Vosges is nearly 3600 feet, and that of the whole chain is nearly 2800 feet. The mean elevation of the Jura is about 4920 feet; whilst it would be almost impossible to appreciate the mean elevation of the French Alps, which in some cases approach 13,000 feet in height. The maximum elevation of the chain which traverses the Côtes du Nord and joins the main ridge near Orleans and the Morvan, does not much exceed 1500 feet.

One consequence of the direction and of the elevation of these chains is, that the snows which fall upon them cannot remain long under the influence of the warm springs of these latitudes; and, as the slopes of many of the principal water-sheds are very abrupt, and the geological constitution of their soils is frequently of a nature to prevent any absorption or retention of water, the prevailing character of the French rivers may be said to be torrential. During the rainy seasons and during thaws, they are full, deep, and rapid, as well as charged with alluvial matters; this state, however, soon ceases, and they become insignificant streamlets, wandering through wide beds of sand and *detritus*—in the former state overwhelming the cultivated and inhabited districts they traverse, whilst they are too violent in their course to be of any service for navigation; in the latter they are of a volume so small as to be equally useless for commercial purposes. The great problem to be solved is, therefore, how are the surplus waters of one season to be retained to supply the deficiences of another? and, in the meantime, how are the swollen winter streams to be guided in their flow, so as to diminish the number and gravity of the accidents of which we have lately heard so much?

The present Emperor of the French, who would appear always to have had a mania for dabbling in engineering, has lately written a letter—almost equivalent to a decree, in the present state of government amongst our neighbours—in which he strongly recommends the execution of a system of embankments across the valleys of the principal rivers, for the purpose of creating artificial lakes, or reservoirs, which should act like the lakes of the Upper Rhine, or Rhone, to store the excess of the winter rains. There can be no doubt but that some such system may render great service; and the case of the embankment of Pinay, referred to by his Majesty, may be fairly appealed to as an illustration of the advantages it offers. The difficulty, however, lies in the awful magnitude of the evil to be dealt with; for not only are the main streams of the Soane, the Rhone, the Loire, the Seine, and the Garonne, exposed to floods of destructive nature, but the numerous large affluents of those principal streams require to be treated separately, not only on account of the magnitude of their own hydrographical basins, but also on account of the interferences they create in the *régimes* of the rivers into which they discharge. The floods of the Lower Rhone, for instance, are sometimes occasioned by the waters flowing from the western slope of the French Alps, through the Arve or the Isère; sometimes by the waters from the Jura and the plateau near Bourg, through the Val Sereine or the Ain: and at others, by the waters from the Charrolais and the Côte d'Or flowing from the Soane. And in like manner the floods of the Gironde are influenced by the waters brought down by the Garonne, the Lot, the Dordogne, or the Isle; that of the Lower Loire by the waters of the Allier, the Cher, the Indre, the Vienne, the Loire, the Sarthe, the Mayenne, and the Esdre; and those of the Seine by the waters flowing in the Aube, the Yonne, the Loigne, the Marne, the Oise, and the Eure. No doubt it would be desirable to make a regulating lake, or reservoir, at the end of the mountainous course of each of these rivers, but the number would be great, and the expense incalculable; besides which, it must not be lost sight of, that if the embankments erected for the purpose of keeping back these waters were to burst in any case, the ruin they might entail would also exceed that they were designed to guard against. There is a wild magnificence about this idea, however, which is likely to appeal strongly to the imagination of the present ruler of France, and possibly its execution may be attempted. Candidly, we confess that we see no other way to overcome the evil; for all the nonsense which has been written with respect to reclothing the hills with woods will be contradicted by the daily extending subdivision of property in France, which renders the maintenance of forest land impossible whenever the soil is sufficiently rich to allow of its being made arable. What would be the cost, though? Far more than the Emperor seems at present to calculate upon; but, it may be, still less than the losses which so often and so heavily afflict the country. It is said that the damage done by these last inundations did not fall short of £8,000,000 sterling, whilst that inflicted by the inundations of the Loire, in 1846, was little short of £2,000,000. These are fearful sums to lose within ten years, and would, in sound political economy, warrant a considerable outlay to prevent their recurrence; for, be it observed, they *must* recur, inasmuch as the inundations from whence they arise are produced by natural causes, which must continue to operate. The only things to be guarded against are mistaken estimates of the magnitude of the operation on the one hand, and mistaken opinions of its easy practicability on the other. The Emperor seems to believe that the valley of the Loire could be protected by an outlay of 3,400,000 francs; if he had said pounds sterling, he would have been nearer the mark, we believe; and, possibly, the other main rivers of France would severally require a similar outlay.

In the case of the Rhone, the lakes of Geneva and Bourget either at present perform the functions of regulating reservoirs, or they might easily be made so to do. It is singular that his Majesty should have made a blunder of such remarkable importance in speaking of M. Vallée's project for dealing with the Lake of Geneva, as to state that he intended to *lower* its waters; whereas, on the contrary, both in the book published in 1843 (*"Du Rhone et du Lac de Genève"*), and in his communication to the *Académie des Sciences*, inserted in their *Comptes Rendus* for the 9th of June of this year, M. Vallée proposed to erect moveable dams on the Rhone at the point where it

leaves the lake, and to turn the Arve into it during the periods of inundation, in order to store the surplus waters brought down at those periods. It is hardly probable that the inhabitants of Geneva should consent to the pollution of their beautiful lake by the muddy stream of the Arve; and, however they may be disposed to keep up the level of the water in this natural reservoir, we question whether even Imperial engineering could ensure the Valley of the Rhone from the destruction occasioned by the floods of the Arve, and the streams from the eastern slope of the Jura, unless it were by lowering and regulating the entrance to the *Lac de Bourget*, so as to enable it to receive the floods of the Arve, the Fier, and the Val Sereine. A great difficulty exists in dealing with the Rhone, in the fact that the main stream and its principal affluents take their origin from states under a different government—in states which are governed by other laws, and have totally independent interests. Switzerland and the Savoy, in fact, would to some extent suffer by the creation of artificial reservoirs, which would submerge the lands around the lakes of Geneva, Annecy, or Bourget, or in the upper part of the Valley of the Isère. Those countries have as manifest an interest in getting rid of the floods as fast as possible, as France has in storing their waters; but these are substantially questions of money, and should be met liberally by all parties. Will they be so, when might is all on one side? and right has, alas! so little to do with politics!

In the valleys of the other large rivers of France, this political complication would not arise, and there can be, in their cases, no external reason for the inaction of the French Government. All that is to be done must, however, be done artificially; for in no other case than in that of the Rhone has Nature provided regulating lakes for the mountainous districts of the water-sheds of the rivers. Fortunately, the highlands which supply the floods are still, as a rule, of but little value; and it would even now be possible to execute, with comparative economy, the necessary works. Every year will add to the pecuniary difficulty, as we before said; for the tendency of the social and political movement of France is decidedly to induce every one to invest his money in land; and, to quote the words of Lucretius, written during a political state not very different from that of France at the present day, we would add—

"Inque dies magis in montem succedere sylvas
Cogebant, infraque locum considere cultis."

It is, nevertheless, to be feared that both the existing organisation and the official traditions of the administration of public works in France may retard the application of, even if they should not render inoperative, the intentions of the Emperor; because, in the first place, it is hardly possible, as the Emperor himself observed, that the engineers can ever know much of their practical duties, according to the present system; and, in the second place, the description of works towards which the opinions of the leading French engineers incline, in the matter of river defences, is founded upon principles which not only recent French experience, but also the former experience of the more successful Piedmontese and Lombard engineers, have proved to be radically false. The defect in the organisation of the French system of public works thus alluded to, arises from the system of advancement, which may practically be said to take place by seniority; and an "*ingénieur aspirant*," after passing several years in a sea-port, and upon hydraulic works, is very likely to be sent on the next vacancy to fill the place of an *ingénieur ordinaire* of an Alpine or Pyreneean district, to become perhaps, after the lapse of many years, the *ingénieur-en-chef* of a section of one of the State railways. This mode of advancement, and the style of education given in the *Ecoles Polytechnique* and *des Ponts et Chaussées*, has resulted in securing to the French Government the services of a body of men versed, in an extraordinary degree, in the abstract theory of their profession; but, as a body, profoundly ignorant of its practical details. When such a body has adopted a theory, it is naturally slow to admit that it has been in error; and, in the case of the defences against the occasional ravages of the torrential rivers of France, the state engineers have, we believe, been led into the adoption of not only a theory, but also a course of action, which events have proved to be totally incorrect, either as providing a temporary or a permanent defence against the inundations; and which it will require the exercise of the despotism of the present Emperor, supported by public opinion, to induce them to renounce.

Indeed, all the works which have been executed of late years upon the French rivers have been designed more with reference to their low-water state, and with a view to the improvement of the navigation, than to deal with the occasional inundations; and the works actually designed to guard against the latter have, in many instances, rather aggravated than diminished the evil as it naturally existed. The Seine, although it frequently overflows its banks, is not sufficiently torrential in its nature to call for extraordinary measures of precaution or defence; and it may be on this account that the dwellers upon its margin have been spared from the disastrous consequences which have followed the rupture of the *levées* of the Loire, upon the occasion of every one of the recent floods. These *levées* consist of lofty embankments parallel to the river, and at no very great distance from the ordinary summer bed, so that they effectually limit the available discharging area in flood times. On the banks of the Po, however—and it is to be observed, that the floods of this Alpine stream are more capricious even than those of the Loire—the Italian engineers adopt a double system of embankments whenever the valley is wide enough to admit of their so doing; the banks which are close to the river are said to be "*in froldi*," and those which are at a greater distance are said to be "*in golene*." When the two systems are executed, the banks in *froldi* are terminated at a lower level than those in *golene*; so that they direct the flow of the waters in the navigable channel, even when they are themselves submerged; and the more distant banks allow the floods to spread over a wider area, and serve to retain also the alluvial matters brought down from the hills. The principal advantage of this system consists, however, in the fact, that during the floods the velocity of the waters is destroyed before they reach the more distant banks, and that the safety of perhaps a large and populous district is not made to depend upon one set of works, as is the case upon the banks of the Loire, where, if one portion of a *levée* be undermined, a whole province may be involved in ruin. It would, no doubt, be humiliating for those very fine gentlemen, the engineers of the *Ponts et Chaussées*, to receive a lesson from abroad: but, until they shall condescend to study the systems dictated by the careful study of the phenomena they have to deal with in other countries, they must be content to find their own theories and practice often at variance with actual facts.

In the main, the Emperor's letter suggests what we believe to be the best course of action, although many of the detailed plans he recommends are, as might be expected, rather amusing—to use a polite phrase. It would unquestionably be desirable to store the excess of water which flows in winter from the high lands at the heads of the French rivers; but to do this in an effectual manner would involve the execution of works of the most colossal and expensive nature, without much prospect of a return. The simplest course is to form the double system of embankments, and to calculate upon the submergence of the broad valleys during extraordinary floods—of course protecting the towns or isolated dwellings which have already been erected in positions such as to require defence. Inundations depend upon natural causes, and let what may be done, they must periodically recur; their evil effects may be attenuated by well-devised measures: they cannot, we believe, ever be entirely prevented, so long as the temperature of the mountainous district of Central France is subject to sudden variations in the early spring, or so long as the snows of that region are likely to be melted and washed away by the warm rains brought by the south-west winds, near the period of the vernal equinox. Fortunately, as we said before, the floods do not often occur simultaneously on the northern and the southern slopes of France; on this occasion, they have been more universally destructive than usual, because they have occurred upon the western and the southern slopes; but, in whatever manner they may occur, human efforts cannot overcome them, though it is certainly possible to avoid exaggerating their evils to the extent to which the ill-directed efforts of the French engineers appear recently to have done.

Circular to Gas Companies.

THE report of the last half-yearly meeting of the Phœnix Gas Company, which will be found in another column, will be read with unalloyed satisfaction by all who are interested in the success of gas companies generally, and may also be studied with profit by those who have hitherto advocated unlimited competition as the best protection for the gas-consuming public. Experience has again demonstrated that such a system not only entails the payment of interest upon a larger capital than would otherwise have been required for the construction

of works, but also materially enhances the cost of distribution; both of which expenses must ultimately fall upon the public, and retard reductions in the price of gas, which, but for these impolitic proceedings, might have been made without compromising the interests of those who had invested their capital in these undertakings. This is so clearly and indisputably set forth in the issue of the contest between the four companies recently competing for the supply of gas in the districts south of the Thames, that a brief sketch of their proceedings will be read with interest at the present moment.

The Phœnix Company was formed in 1824. At later periods, its territory was successively invaded by the South Metropolitan, the London, the Deptford, and the Surrey Consumers' Companies. An active competition was carried on between the various bodies for several years, till the Phœnix retired from the Deptford district, and in January, 1854, the other four companies came to an arrangement for an equitable division of the district; and subsequently the Deptford become merged in the Surrey Consumers' undertaking. The effect of this arrangement upon the Phœnix Company has been to reduce their gas leakage from 31 to 14¾ per cent., and to increase the revenue from 29s. 3½d. to 35s. 3¾d. per ton of coal carbonised, without any alteration in the price of gas. In the half year ending Midsummer, 1855, the coals carbonised were 33,437 tons, to produce a gas rental of £48,983; whereas 30,524 tons of coal yielded a gas rental of £53,901 during the last half year; and the saving in coals, combined with their increased produce, has added about £14,000 to the net yearly profit. This has enabled the directors to add 2 per cent. to their dividend, and it justifies the proposed reduction in the price of gas in the surburban districts from 5s. 6d. to 5s. per 1000 feet. Comment upon such results is unnecessary. Time will, however, show whether an experiment so eminently successful will be lost upon the Chartered, the City of London, the Equitable, the London, the Western, and the Great Central Companies; and whether the present waste of money and the pollution of the soil consequent upon the multiplicity of gas-pipes, where one would have sufficed, is to be perpetuated. To us, it appears that these bodies incur a heavy responsibility in allowing any petty jealousies to interfere in carrying out an arrangement equally beneficial to the public and to their constituents.

A prospectus has been issued, under respectable patronage, for the formation of a company under the title of "The British Portable Gas Company," for the purpose of introducing and bringing into use a new "improved gas apparatus," under patent granted to Mr. Abram Longbottom, dated September 13, 1855. The material from which it is proposed to manufacture gas is stated to be a resinous oil, the cost of which, in the principal ports of the kingdom, is calculated to be 9d. per gallon; but as the estimated cost of the gas, with a manufacture of 700,000 cubic feet per annum, after deducting nearly two-thirds of the first expense of the oil for the value of the residual products, is 7s. 6d. per 1000 feet, without any allowance for leakage or the expenses of distribution, it is evident the system can never come into competition with coal gas, or can be successfully introduced wherever a supply can be obtained from any public establishment. The prospectus, however, is free from much of the exaggeration which usually characterises similar projects, though we doubt its success, after the experience of the Vegetable Gas Company, and several other schemes for the manufacture of gas upon a small scale in private establishments; and we cannot refrain from expressing our opinion that £30 is an adequate estimate of the cost of fuel for the destructive distillation of 8912 gallons of oil. Experience has also taught us to place little reliance upon experiments of this nature of short duration, as the surfaces of the retorts soon become coated with a carbonaceous deposit, which materially reduces their decomposing powers, and finally transforms such vessels into simple stills, converting the oil into vapour, which is re-converted into oil by condensation. Mr. Longbottom, following the example of Messrs. Taylor and Martineau, Daniell, and others, partially fills his retort with some material presenting a large heated surface, with the view of aiding the decomposition of the vapours; but these substances in their turn became inert, after a short period, and have to be renewed—an operation which is almost equivalent to the charging and discharging of a coal-gas retort. An apparatus for lighting small establishments is doubtless much wanted; but we are of opinion that cannel coal, and not oil, is the material which offers the greatest chance of success for such a purpose.

The liberation of the heavy amount of tonnage engaged in the transport service during the war has not been attended with the reduction in coal freights from northern ports which might have been expected, London freights being now quoted within 3d. per ton of the rates current a year ago. Some screw colliers have, however, been chartered by the year, at 7s. per ton, which is 1s. less than the present rate for the pool.

Communicated Articles.

OBSERVATIONS ON THE MODE OF ASCERTAINING THE STANDARD OF GAS.

By M. Jeanneney, *of Mulhouse.*

To show the great importance of noticing exactly the power of the burner in candles, and the pressure when determining the standard of gas, as indicated in the table inserted in the preceding number of the Journal of Gas Lighting, I adduce the following series of experiments:—Specified forms are given to all my pupils to fill up, for the purpose of impressing upon them the influence of the size of the flame, and of the pressure in the useful effect of a given volume of gas in burning. The experiments are directed to be conducted as follows:—

Experiments to be made to learn how to burn Gas as advantageously as possible.

1. Maintain the distances of the gas-bruner and the candle, so that the ratio of the squares of the distances may be equal to 7·50. Try all the burners of the series, and vary the pressure so as to make the shadows equal. State the consumption of gas by each burner, according to the conditions noted in the table.

2. Keep the pressure at seven millimètres, and try all the burners of the series, ascertaining in each case the distance of the candle, and the consumption of gas per hour. Try the Dumas and Lambert burners with a pressure of three and the Argand burner with a pressure of five millimètres.

3. Keep the consumption of gas at 100 litres. Try all the burners of the series, ascertaining each time the pressure and the distance of the candle.

4. Take a burner that consumes 100 litres per hour, and try it at the pressures of 2, 4, 6, 8, 10, 12 and 15 millimètres, and ascertain the power of the light and the quantity consumed, to deduce therefrom the standard of the gas.

5. Try separately how much gas-burners of from 1 to 20 candles consume under a pressure of from 6 to 8 millimètres (averaging 7).

[The following is the series of burners experimented with. The figures indicate the number of litres consumed under a pressure of 7 millimètres of coal gas, the standard of which was 7 candles the 100 litres:—10, 12½, 15, 17½, 20, 22½, 25, 30, 40, 50, 62½, 75, 87½, 100, 125, 150, 175, 200.]

Results of the Experiments.—Table No. I.

Description of Burner.	Pressure in Millimètres.	Power of the Burner.	Consumption per Hour in Litres.	Standard of the Gas.
Union jets consuming—				
87½ litres per hour, with a pressure of 7 millimètres	25	7½	175	4·45
100 do.	9½	7½	120	6·24
125 do.	6½	7½	112	6·70
150 do.	2½	7½	102	7·35
200 do.	2	7½	110	6·82
Argand	5½	7½	172	6·68
Lambert's	3½	7½	103	7·28
Dumas's	3½	7½	100	7·50
Aperture without burner	0	7½	172	4·35

Table No. II.

The pressure maintained at 7 millimètres throughout, the constant distance from the burner being 1·915 m., the square of which is 3·67.

Description of Burner.	Distance of the Candle.	Square of the Distance.	Ratio of the Squares.	Consumption per Hour in Litres.	Standard of the Gas.
Union jets consuming—					
40 litres per hour, with a pressure of 7 millimètres	1·75	3·050	1·20	44	2·73
50 do.	1·51	2·280	1·61	50	3·22
62½ do.	1·15	1·322	2·77	64	4·35
75 do.	1·05	1·100	3·33	72	4·63
87½ do.	0·90	0·810	4·52	85	5·32
100 do.	0·76	0·579	6·34	100	6·34
125 do.	0·69	0·477	7·71	125	6·16
150 do.	0·53	0·281	13·06	170	7·68
175 do.	0·48	0·231	15·90	202	7·88
200 do.	0·50	0·250	14·70	215	6·84

Table No. III.

Description of Burner.	Pressure in Millimètres.	Distance of the Candle.	Standard of the Gas.	Consumption per Hour in Litres.
Union jets consuming—				
62½ litres per hour, with a pressure of 7 millimètres	16	0·95	4·05	100
75 do.	13	0·90	4·32	100
87½ do.	10	0·85	5·06	100
100 do.	9	0·76	6·33	100
125 do.	5½	0·72	7·07	100
150 do.	2½	0·70	7·50	100
175 do.	2½	0·70	7·50	100
200 do.	1½	0·74	6·69	100
Aperture without burner	1½	0·85	4·72	100
Argand	4½	0·78	6·02	100
Dumas's	3½	0·68	7·92	100
Lambert's	3½	0·70	7·50	100

TABLE No. IV.

Description of Burner.	Pressure in Millimètres.	Consumption per Hour in Litres.	Distance of the Candle.	Power of the Burner.	Standard of the Gas.
Union jets consuming—					
100 litres per hour, with a pressure of 7 millimètres	2	46	1·18	2·63	5·71
100 do.	4	71	0·87	4·84	6·71
100 do.	6	91	0·77	6·18	6·80
100 do.	8	105	0·75	6·52	6·21
100 do.	10	120	0·72	7·07	5·29
100 do.	12	135	0·70	7·50	5·55
100 do.	15	154	0·65	8·70	5·63

Remarks on Table I.—The five first experiments in this table show that, as far as the burner of 150 litres, the standard of the gas increases with the intensity of the flame as the pressure is diminished—the intensity of flame signifying the number of candles equivalent to the burner. When the size of 150 litres is exceeded, the standard is lowered when the orifice is increased—that is to say, as the pressure is diminished. The flame then smokes, because a portion of the carbon is not consumed; the flame is too concentrated, there is not sufficient contact with the air, and the carbon not meeting with sufficient oxygen to combine with it, gives out smoke. Up to a certain point there is considerable advantage in the concentration of the combustion within a small space, but beyond that point the loss exceeds the gain. What takes place when the gas is burnt from the aperture without a burner, shows still more clearly the effect of the diminished consumption of the carbon. In short, the cause of the increase of the standard of the gas by lowering the pressure is, that the flame is less extended, and there is consequently less contact with the air, which is one cause of reducing the temperature. Light is nothing more than temperature.

Remarks on Table II.—In these experiments the pressure was constant, but the intensity of the flame varied. The standard of the gas, it will be observed, increased with the size of the burner; but there was nevertheless a *maximum* point, because, when the aperture of the burner was too large, the flame became too dense, and some of the carbon was not consumed. The cause of this is the same as in the experiments of Table I. A small sphere has a larger surface, compared with its bulk, than a great one; and, as the heat or light proceeds from the volume of the sphere, and the cooling influence is exerted on the surface, the greater the proportion of the heating body to the surface, the gas will burn at a higher temperature. As it is desirable, however, that there should be no smoke, this sphere must not be too large, for then the carbon in the centre of the flame escapes without being consumed.

Remarks on Table III.—In England it is thought sufficient to try one burner of a given size, which is based upon a consumption of five cubic feet, in comparing two gases, and no account is taken of the pressure; the varying amount of which, however, alters the size of the flame, and consequently produces a difference in the cooling influence of the air. This table shows that the English only look at one side of the question, and do not know the cause of the phenomenon they observe.

Remarks on Table IV.—The knowledge of the ruling principle, that gas should be burnt at a high temperature, and of the two following principles, that the greatest intensity of flame should be obtained—or, in other words, the largest possible flame—and that it should be concentrated and not spread, will explain the results of Table No. 4.

If, when using the same burner, the pressure be regularly increased, the standard of the gas will be raised up to a certain point, because the flame becomes larger; but, as this increase in the size of the flame is owing to an increase of the pressure—that is to say, to a cause which diminishes the combustion—it follows that there are two forces brought into action—one of which is useful, the other prejudicial. These forces are developed by turning the stop-cock, and the diminishing or cooling influence at length gains the mastery, and the standard of the gas is lowered, which effect takes place when the pressure exceeds eight millimètres. This *maximum*, however, will vary with different qualities of gas.

The gas employed in all these preceding experiments was from the works of Mulhouse; but, by passing it through the gasometer during the experiments, its standard was lowered to be about 6·35. When tested directly from the mains, the standard of the gas of Mulhouse is generally above 7.

Register of New Patents.

403.—HYAM JACOB HYAMS, of Stanhope Street, Hampstead Road, in the co. of Middlesex, gas-meter maker, for "*Improvements in the construction of gas-meters.*" Patent dated Feb. 16, 1856.

This invention consists in the construction of gas-meters, commonly called dry gas-meters, and in which one side of the measuring compartments is formed by means of a moveable or flexible diaphragm.

The first part of these improvements consists in connecting together the rigid parts of the moveable diaphragm, so that they may be made to act together—that is, when one is moved by the pressure of the gas entering the meter, it will by being connected to the other one by means of a rigid rod or bar move the other one also, and assist in delivering the gas from the meter.

The second improvement relates to an improved mode of constructing the valve, which is of that description of valve known as the rotary valve, and consists in attaching the circular rotating plate of the valve to a crank, whereby it is moved eccentrically, or in a similar manner to that of the eccentric of a steam-engine. By this means the several apertures, whereby the gas passes through the valve from one part of the meter to another, are uncovered in rotation.

The claim is for—

1. The connecting together the rigid parts of the moveable diaphragms so that they may be made to act together as above described.

Also, for the construction and arrangement of the rotating circular valve, as shown; and also the mode of actuating the same.

421.—WILLIAM SAVORY, of Gloucester, engineer, and HENRY ARKELL, of the same place, builder, for "*Improvements in apparatus for the passage of water and other fluids.*" Provisional protection only obtained. Dated Feb. 19, 1856.

This invention has for its object improvements in apparatus for the passage of water and other fluids. For this purpose the tubular passage through which the water or other fluid is to flow, is made with an enlargement, or chamber, to receive an internal valve, one end of the spindle of which passes through a stuffing-box formed on a cover of such chamber. The valve is faced with vulcanised indiarubber, which rests on a projecting ring, or seat, formed at the inner end of the tubular outlet. The inner end of the spindle turns in a recess on the interior, and the cover is fixed by screws. The valve opens against the flow of water or fluid, and is, therefore, pressed on at the back when closed by the fluid.

424.—RICHARD LAMING, of Carlton Villas, Maida Hill, Paddington, in the co. of Middlesex, for "*Improvements in purifying gas, in preparing materials useful for purifying gas, and in apparatus to be used in purifying gas, and disenfecting gas liquors or washings.*" Patent dated Feb. 20, 1856.

The claim is for—

1. The use of quick-lime, mixed with any deliquescent substance, for removing moisture and naphthaline from gas.

2. The use of one and the same portion of water—first, to wash gas after its leaves a gasholder; and, secondly, to wash gas on its way to a gasholder.

3. The manufacture of materials useful for purifying gas by peroxidizing either at a low red heat, or any lower and adequate temperature, a lower oxide of iron artificially distributed either by itself or in combination with an acid in earthy matter, or in a mixture of earthy matters capable of neutralising the acid, if any be combined with the iron, the said materials not containing any porous substance of a combustible nature.

4. The use of such perforated diaphragms in vessels for washing or scrubbing gas as are constructed each of two horizontal planes, placed one a little above of the other, the perforations of the two planes not coinciding vertically. Also the use of gas-washers, or scrubbers, each acting by a vertical and previous diaphragm made of absorbent material, kept wetted by water, diluted acid, or other purifying liquid constantly descending from top to bottom of the diaphragm, and through which the gas is made to pass on its way upwards through the apparatus any number of times that may be requisite.

5. The use of the apparatus described for disinfecting gas-liquors, or washings.

432.—WILLIAM CLIBRAN and JOSEPH CLIBRAN, of the city of Manchester, machinists and manufacturers of gas-regulators, for "*Improvements in and applicable to apparatus or mechanism for measuring and regulating the flow of gas, and in the mode of constructing parts thereof.*" Provisional protection only obtained. Dated Feb. 20, 1856.

1. These improvements consist in adapting gas-regulators so that they may be used and made to serve the purpose of a "stop-cock," by fitting the valve of the regulator so that when close to its seat, or facing it, it will effectually stop the passage of gas, and by arranging mechanism (such as a screw, lever, weight, or spring) which will keep it close against its seat or facing when the gas is required to be shut off, but which will leave it at perfect liberty to regulate the pressure of the gas when it is required for consumption.

2. In applying and arranging a valve in one of the gas passages of gas-regulators to answer the purpose of a stop-cock.

3. In the arrangement of a gas-regulator apparatus to be worked by water, that will not require frequent attention, which consists in employing a small case similar in form to a gasometer, arranged in a closed vessel containing water in the same manner as a gasometer, but so that the pressure of the gas, instead of acting upon the interior to force it out of the water, acts on the exterior of it, tending to sink it in the water. This case is connected to the spindle of a valve which has its seating or facing in a chamber above the case into which chamber the gas is admitted. The case has a float attached to its lower end, and sufficiently buoyant to support the weight of the case, valve-spindle, and valve attached thereto, and to resist the pressure of the gas acting upon it; and thus keep open the valve as long as the pressure does not exceed the required amount.

To prevent resistance to the movement of the case by the air contained in its interior above the surface of the water, a pipe is arranged to communicate with the interior of the case and the atmosphere, so that the air within it may have a free passage to and from it on its rise or fall. This pipe extends above the water-line, and acts as well as a guide to the case, being placed in its axis. An increase or decrease in the depth of the water does not materially affect the action of this regulator as long as the float is submerged, as its buoyant power is only increased or decreased by the depth of the water, in proportion to the difference between the weight of the material in that portion of the case submerged above the float and the water displaced by it; the case being very thin, this difference is but small in amount. On this account the regulator will require but little attention, as a great depth of water may be employed; but when deficient, it will give warning by stopping the supply of gas, but before the deficiency will allow any escape of the gas.

4. In applying to, and combining with, gas-meters a gas-regulator worked by the water of the meter, or by water in connection with that in the meter. This is accomplished by a gas-regulator arranged in a manner similar to that described under the second head of these improvements.

5. In combining with a gas-meter a gas-regulator, which will also serve the purpose of the stop-valve employed in that class of meters denominated wet meters, to shut off the supply of gas to the meter when the water gets

too low. This is accomplished by arranging the gas-regulator mentioned under the second and third heads of these improvements, in the place of the stop-valve and float of the wet meter, and in such manner that its float will cease to be submerged when the water in the meter gets below the point fixed upon.

6. In arranging the combination described under the fourth head of these improvements, so that the valve therein, acting as the regulator and stop-valve, may be made also to answer as the stop-cock, accomplished by means of similar mechanism to that referred to for this purpose under the first head of this invention.

7. In the arrangement and mode of constructing gas-regulators of such small proportions that it will be found advantageous to apply them to regulate the supply of gas to single lights, such as the street lamps. This is accomplished by a simple arrangement of the parts, by reducing their size and weight, and by drilling the gas passages, and making the receiver of thin metal, which may be made from flat discs of metal, shaped to the form required by being forced through holes.

476.—FREDERICK KERSEY, of 5, Laurie Terrace, St. George's Road, Southwark, for "*An improvement in the manufacture of drain-pipes.*" Patent dated Feb. 25, 1856.

The object of this invention is the constructing earthenware pipes so as to give additional facility for correctly laying such pipes, and for opening them in case of stoppage. For these purposes an ordinary whole socket-pipe is made, and while it is in a green state the socket and part of the plain pipe is divided, or it may be the plain end of the pipe longitudinally, by a cutting wire, or otherwise, for any required length, and then by a transverse cut commencing at the end of the longitudinal one. By that means a portion of it may be removed, and when the drain is laid, serves as a lid or cover, which can be removed when desired; or pieces of similar form to those obtained by thus dividing a socket-pipe may be otherwise moulded or formed. Pipes thus constructed are laid at intervals in a drain of ordinary socket-pipes, so that by removing the lids above described, the state of the drain may be ascertained, or a damaged pipe may be removed.

514.—CHARLES ALEXANDRE DE FONBONNE, of Paris, for "*Improved apparatus for the manufacture of coke, and for blasting; also for the production and extraction of illuminating and combustible gas, as well as ammoniacal and bituminous matters, part of such apparatus being applicable to the consumption of smoke.*" Patent dated Feb. 28, 1856.

The following will be found a convenient construction of apparatus for effecting the objects of this invention:—First, as regards the apparatus for the manufacture of coke and gas; it consists of four furnaces set in pairs in brickwork, back to back, an opening being formed at the top of each, communicating by a flue to a chimney or chimneys; the above opening serving also for charging the furnaces with the material or substance to be distilled. The lower part of the opening is luted and made air-tight by a bonnet or cover immersed in fine sand, and the upper part of said opening is covered with a fire-brick or tile. There is a vertical flue in which the flames from the other three furnaces collect, when such said furnaces are not extracting. Under the sole of each furnace a circulating flue is built, and communicates with another flue, or flues, for conducting the heat from the three last-mentioned furnaces under the sole of that furnace which is extracting the above. Flues are provided with suitable dampers for regulating the heat and diverting its course when necessary. There is a pipe in the crown of each furnace connected at top to a vessel containing liquid, into which the gaseous and other products pass by means of hydraulic valves fixed to the top of the said vessel; one of these valves is employed for regulating the pressure in the furnaces, and for establishing, or cutting off, as desired, the communication between one or other of them and an artificial draught apparatus, hereafter described, and the other valve communicates with the gasometer. The above valves are furnished with appliances for actuating them by hand. Each of the above vessels is furnished with a syphon-pipe, for maintaining the liquid in the same at an uniform level.

2. As regards the blasting, it consists of an artificial draught apparatus, composed of two cylinders, one placed within the other, and a loose piston or hollow cylinder closed at top, the lower edge whereof dips in water contained between the two cylinders. In connection with the above cylinders there is a branch pipe, one part of which passes through the top of the outer cylinder, to which it is connected by a flanch; said pipe also passes through a hole in the top of the piston, which slides up and down the same. There are two other branches to said branch pipe, the lower ends of which are respectively fixed to two separate vessels containing water. One of the aforesaid pipes dips into the water, and the other one is simply fixed to the top of the box. Into an opening in another part of the top of each of the aforesaid boxes another pipe is fixed; one of such pipes dips into the water in that box in whtch the before-mentioned branch pipe does not dip, and the pipe of the other box is simply fixed to the top thereof. The above apparatus is connected to another similar apparatus, and motion imparted alternately to the piston thereof by a vibrating beam connected thereto, or in any other convenient manner; and as regards the consumption of smoke, the artificial draught apparatus lastly above mentioned may be used with advantage for that purpose.

The claim is for—

1. The general arrangement of the entire apparatus for the purposes above stated.

2. The use and employment of the compensating vessel.

3. The use and employment of the artificial draught apparatus for the manufacture of coke, as also the consumption or prevention of smoke in furnaces generally, by exhausting the smoke from the furnace in the manner above described.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED PATENTS.

1835.—CHARLES THEODORE LAUNAY and JULES CHOPPIN, of Paris, gasfitters, for "*Improvements in increasing the illuminating power of gas.*" Aug. 4, 1856.

1859.—JAMES FARRAR, of Bury, in the co. of Lancaster, and HENRY SPENCER, of Rochdale, in the same co., agents, for "*Improvements in apparatus for regulating the pressure and flow of gaseous fluids.*" Aug. 6, 1856.

1877.—EMILE KNOPP, of Paris, professor of chemistry, for "*Improvements in the manufacture of gas.*" *Aug.* 9, 1856.

1882.—EDWARD OWEN, of Aberdeen Terrace, Blackheath, in the co. of Kent, chemist, for "*Improvements in the manufacture of gas, and in the obtainment of products arising in such manufacture.*" Aug. 9, 1856.

1883.—GEORGE ANDERSON, of 22, Queen's Road, Dalston, in the co. of Middlesex, gas engineer, for "*Improvements in the construction of taps or valves for regulating the passage of gas.*" Aug. 9, 1856.

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED PATENTS.

1384.—WILLIAM HENRY WESTWOOD, THOMAS WRIGHT, and EDWARD WRIGHT, of Queen's Cross, Dudley, in the co. of Worcester, boiler and gasholder makers and engineers, for "*An improved stop or regulating valve.*" June 11, 1856.

1449.—JACINTO DIAS DAMAZIO, of Lisbon, in the kingdom of Portugal, merchant, for "*A new process of making, illuminating, and heating gas by a double distillation without retort.*" June 19, 1856.

1530.—SAMUEL JABEZ GOODE, of Aston, machinist, for "*Improvements in gas stoves, and the application of the same to the ventilation of buildings.*" June 30, 1856.

1826.—WILLIAM FRANKLIN SHAW, of the state of Massachusetts, U.S.A., for "*An improved burner or apparatus for the combustion of air and inflammable gas.*" Aug. 1, 1856.

1882.—EDWARD OWEN, of Aberdeen Terrace, Blackheath, in the co. of Kent, chemist, for "*Improvements in the manufacture of gas, and in the obtainment of products arising in such manufacture.*" Aug. 9, 1856.

Miscellaneous News.

THE METROPOLITAN BOARD OF WORKS.

FRIDAY, AUGUST 29.

The board met this day in the Council Chamber, Guildhall, for the transaction of ordinary and general business only. There was but a thin attendance of members. Mr. THWAITES took the chair at twelve o'clock, and the minutes of the last special and weekly meeting were read and approved.

THE EFFRA SEWER.

This being the day appointed for the purpose, the board proceeded to receive tenders from parties willing to contract for the laying down, constructing, and completely finishing a certain intended brick sewer, 300 feet in length, or thereabouts, with other works in connection therewith, in the line of the open Effra Sewer, at the Canterbury Road, North Brixton, in the county of Surrey, and for the maintenance of such works in complete repair for twelve calendar months.

The CHAIRMAN said, this being the first occasion on which the board had to decide on a matter of this kind, he was desirous to know their opinion as to whether the public should be present during the opening of the tenders, and whether publicity should be given to the proceedings.

Mr. OFFOR moved, "That during the opening of the tenders strangers do withdraw."

Mr. LESLIE objected to such a course. It was desirable that the utmost publicity should be given to all their proceedings, if they would retain the confidence of their constituents.

Mr. DOULTON said it was evidently inconvenient to discuss in an open board meeting the reasons for receiving or rejecting tenders of this kind. He had understood that the intention was to receive the documents, and refer them to a committee of the board for consideration.

Mr. LESLIE contended that the publicity of the affair was the greatest safeguard that could be given for the proper discharge of the duties of the board in this respect. Nor did he think that the parties tendering would have any reason to complain, as, when they replied to the intimation of the board that they were willing to submit their work to public competition, they were quite aware that their offers would be subjected to all the inquiries and examination the board thought fit to make.

Mr. WARE felt that to discuss the tenders publicly might be injurious to some of the parties who had sent them in.

Major LYON then moved, and Mr. DOULTON seconded, "That the board do now resolve itself into a committee of the whole board to consider the subject."

The CHAIRMAN expressed his opinion that this was the wisest course, because a discussion in open board might, in some cases, throw an undeserved slur upon one or other of the parties tendering, and who, with every desire to do their duty, might in the opinion of honourable members be not exactly in a position to execute the work satisfactorily.

After some further conversation, in which Messrs. Crellin, Pascall, and Hawkes took part, the proposal of Major Lyon was adopted.

The court having been cleared, the board resolved itself into committee.

On resuming, the CHAIRMAN reported that the board had received the following eight tenders for the work:—

Edward Thirst	£609
Thomas Ennor	845
Joseph Yeoman	728
John Murray	688
Edward William Frazer	725
William Hill	717
William H. Roe	840
John Phillips	800

and that the committee recommended the board to accept the first.

On the motion of Mr. OFFOR, the recommendation was agreed to.

FINANCE.

The CLERK read a report on the state of the collections of the district sewers' rates for July, 1856, which showed the following results:—

Total of rate	£241,678
Already collected	222,176
Collected last month	2,271
To be collected	£17,229

Warrants were then issued against defaulters of district sewers' rates, and certain deficiencies allowed thereon.

The cash account showed a balance in hands of treasurer, August 25, 1856, of £6665. 11s. 4d.; cheques drawn but not presented, £2526. 8s. 2d.; available balance, £4139. 3s. 2d.; amount of deposit account, £117,522. 2s. 2d.; total general balance, £121,661. 5s. 4d.

ENGINEER'S REPORTS.

Mr. Bazalgette's report on the complaint of Mr. Dixon, of injury sustained by him in consequence of drainage being discharged into his private sewer

and dock at Limehouse, and applying to have his dock cleansed, and to be compensated for the damage done, was then brought up. It stated that the questions involved were of a complicated nature, involving legal considerations. It was alleged that the commissioners of sewers for the Tower Hamlets, in 1840, sanctioned the construction of certain branch sewers for the drainage of other premises, and discharging into Mr. Dixon's sewer without his consent; and that, subsequently, the Metropolitan Commission of Sewers sanctioned the construction of other sewers, shown upon the map accompanying the report, and having their discharge into Mr. Dixon's dock, without his consent. It did not, however, appear from the court documents that the last-mentioned drainage was ever applied for or sanctioned by the Metropolitan Commissioners of Sewers. Mr. Dixon had, from time to time, complained of the additional quantity of sewerage which has been discharged into his sewer and dock by the above-mentioned sewers, and had claimed to be reimbursed the cost of cleansing the same, and a remittance of the sewers' rates. The report stated at length the proceedings which had been taken thereon up to the present time. It appeared from these that the engineer of the late commission had reported that the sewer in question had at all times been cleansed, repaired, and kept in repair by the Commissioners of Sewers, and recommended that Mr. Dixon should be called upon to pay the rates, and that the commissioners had made the order accordingly. The depth of the mud in the dock at the present time averaged 3 feet 6 inches, and it would cost £100 to cleanse it. Mr. Dixon asked the board to do this, and offered to refer the whole matter to the arbitration of an engineer to be agreed on.

On the motion of Mr. LESLIE, seconded by Mr. WARE, it was resolved that the further consideration of the question be adjourned till the first full board in October; and on the suggestion of Mr. OFFOR, it was ordered that a return be made to the board with reference to the question as to at whose expense the sewer was originally constructed, when it first received the sanction of the Commissioners of Sewers, and when it was first used by the public.

Some conversation took place on a report of the engineer as to the drunkenness of a sluice-keeper, and the board divided on a motion for his dismissal, which was negatived by the casting vote of the chairman. It was ordered that the officer be brought before the board and reprimanded.

Mr. BAZALGETTE reported on applications from vestries and district boards to construct sewers in Hertford Place, Manor Place, Waterloo Street, Garden Place, Mark's Place, and Norman's Buildings, Shoreditch; Luton Place, Greenwich; Rotherhithe New Road, east side of Silver Street, east side of Cow Lane, Rotherhithe; Summerford Grove, Brooksby's Walk, and Silk Row, Hackney; Byron Street, Wellington Street, and the Avenue, Poplar; Well Walk, Hampstead; and the necessary orders were made thereon. Several reports were also read and disposed of on complaints of nuisance, &c., and on works of emergency.

THE METROPOLIS BUILDING ACT.

The board were occupied for some hours in considering reports from the superintending architect on proposed alterations in private houses, shops, &c., which call for no special remark. In the course of the discussion which ensued upon one of them, in which the architect stated, that upon inspection he found that the plan sent in was not accurate, and he had caused another to be prepared,

Mr. LESLIE inquired who paid the expenses of these applications and plans?

The CHAIRMAN said, whatever the expense was, it was paid by the board.

Mr. LESLIE said, the act of Parliament distinctly provided that they should be paid for by the applicants themselves, and he appealed to the Clerk as to the correctness of his statement.

The CLERK said that Mr. Leslie was quite right. The 56th section provided that a scale of fees should be fixed upon by the board.

Mr. LESLIE thought that the system now adopted only held out inducements to parties to come before the board with imperfectly prepared plans, in the hope of having them verified or completed.

Mr. MORELAND said, at an early stage of the existence of the board, a resolution had been adopted that no fees should be taken.

Mr. LESLIE said, it was impossible for the board, by any bye-law, to override what the act of Parliament said they should do. He considered that it would be a good ground for appealing against their rates, to allege that the board were spending the public money on work that ought to be done by the builders of the applicants.

On another and somewhat similar report being brought up, Mr. LESLIE raised the same objection.

Major LYON, in moving the adoption of the report, said he hoped it would be an instruction to the superintending-architect, and the officers under him, not to make these plans for applicants. In the present case it did not appear to be of much consequence, nor to involve the expenditure of much time, but it was quite evident that, if these applications increased in the ratio they had hitherto done, it would become a very serious question.

Mr. COLLINSON, in seconding the motion, expressed a hope that the committee appointed to consider the duties of the board under the Building Act would speedily frame a scale of fees to be paid on such applications.

The CHAIRMAN said, he should be glad if the board would take up this question as one of principle rather than of detail. To raise a discussion every time such applications came before them was a course which would tend very much to lessen the practical character of the board in the estimation of the public. He thought it would be better for some honourable member to give notice of a distinct motion, to the effect that the architect should not be at liberty to give any information to parties applying with plans for proposed alterations. He was satisfied that they would save time and gain credit with the public thereby.

Mr. LESLIE said he had never raised the question of expense till that morning.

The CHAIRMAN did not so much allude to the question of expense as to the propriety or otherwise of the architect making or suggesting alterations in plans, or giving any intimation of what would be satisfactory to the board.

Mr. LESLIE stated that he would bring the subject forward again after the recess.

The CLERK read his opinion on the construction of the 26th section of the Metropolitan Building Act, 18 and 19 Vic., c. 122, and the same was ordered to be printed.

THE SOUTHERN DRAINAGE OUTFALL.

The CLERK read a letter from the commissioners acting under "The Gravesend Improvement Act, 1856," respectfully requesting the favour to be informed whether the Metropolitan Board of Works contemplated the construction of the outfall of the London sewerage into any part of the River Thames, or into or upon any land contiguous thereto; and if any, how far distant it was proposed from the town of Gravesend and Tilbury Fort? They asked for this information so that they might be able to communicate such reliable statements through the town of Gravesend as would allay the apprehension entertained from, it was hoped, unfounded reports of such outfall being projected in so near a locality to the town that it must produce most injurious effects on the health of the inhabitants, amounting to nearly 20,000, and otherwise work the greatest injury to the town and to the property therein.

It was ordered that the letter be acknowledged, and the commissioners informed that the board had not yet decided upon any outfall.

The board then adjourned.

EVIDENCE OF LEWIS THOMPSON, ESQ., BEFORE THE PARLIAMENTARY COMMITTEE ON THE ADULTERATION OF FOOD.

FEB. 29, 1856.

CHAIRMAN: I believe you are by profession an analytical chemist?—I am a medical man also, a member of the College of Surgeons, and a licentiate of the Apothecaries' Company.

Do you practise as a medical man?—I do.

And also as an analytical chemist?—Yes.

I believe you have devoted a good deal of attention to the question of adulteration, especially in reference to bread, and to porter and beer?—I have paid attention to adulterations generally for some years; I have been called to do so as a part of my profession.

The committee wish to call your attention, in the first instance, to the two articles I have named. With respect to the adulteration of bread, will you state to the committee what your experience has been in the examination of that article of food?—In respect to bread, I have within the last eight months examined bread obtained at 78 different shops; I have, in fact, obtained other samples more recently; but I dare say they are from some of the other shops. In 78 cases, at all events, the shops have been different, and the samples have been procured, for the most part, by common people—not by myself; sometimes by workmen, and sometimes by their wives.

Were they purchased for the purpose of being examined?—Yes.

And sent for to the shops by yourself?—Yes; I wished to be very certain as to the authenticity of the samples. In all these cases I have no doubt alum had been added to the bread.

Lord C. HAMILTON: In the whole 78 cases?—I have no doubt of it; I found it quite impossible, however, to ascertain that fact chemically; that is to say, although alum had been added to the mixture of which the bread was made, when baked the bread contained no alum; there was no alum in the bread

CHAIRMAN: How do you arrive at the conclusion that it had originally contained alum?—Because I was able to find the constituents of alum in the whole of the bread.

What do you call the constituents of alum?—The constituents of alum are sulphuric acid, potash, and alumina, with water.

Those constituents you found in bread?—I did, but not combined; they are alum only when combined.

Mr WISE: How much alum have you found in a 4-lb. loaf?—The supposed quantity might have varied from 20 grains to 30 on the average.

Would such a quantity as that be injurious to health if taken every day?—That quantity of alum swallowed would be unquestionably objectionable.

No one person eats 4 lbs. of bread a day?—No, nor in eating bread does he eat alum. There it is I think the committee has been led away by erroneous statements.

The property of the alum exists, does it not?—No, the property of the alum is totally destroyed.

Mr. PEACOCKE: Should the constituent parts of alum be found in any of the legitimate component parts of bread?—Not, properly speaking; the constituents of alum do not exist in wheat, and therefore they should not exist in wheat flour.

Nor in the yeast?—No, nor in the yeast. What I wish to observe is that the finding of those things is no proof that alum has been contained in the bread, or mixed with it; they might be added separately; that is, I could add alumina to the flour; I could add sulphate of potash or bisulphate of potash to the flour; I should then have the constituents of alum, but I should not have added alum.

Viscount GODERICH: Do you think those substances had been added to the bread separately?—No; I have no doubt that alum had been added to the bread.

Lord C. HAMILTON: Would not the combination of great heat with moisture reduce the alum to those products which you have described?—No; it is the contact with the flour which does it.

Alum and wheat flour combined, being subjected to moisture and to heat, would produce the result which you have described?—Yes; but you would have no alum.

You would have the elements of the alum as changed in their appearance by the action of heat and moisture?—Yes; and their action upon the human system is also altered.

Therefore what you mean to say is, that you do not find alum in its true form, but you find those products to which it is reduced after being subjected to moisture and great heat?—There must be also the presence of the gluten.

Viscount GODERICH: Do you consider that in that decomposed state it is not injurious to health?—I should say not; alumina is quite insoluble, and bisulphate of potash would have a totally different effect to alumina. In fact, if it had any action at all, it would be that of a purgative; it would have no astringent action at all.

CHAIRMAN: If, instead of 10 or 20 grains, you found 50 grains or 75, what would your opinion be?—Fifty, or even 100, grains in a quartern loaf, I should think, would be totally decomposed.

And in that state you think it would be in no degree injurious to health?—We should then have to consider it as bisulphate of potash—a comparatively harmless agent, a substance which would certainly have very little action, and which I should suppose, as a medical man, would be rather beneficial than otherwise, especially with sedentary people.

Mr. WISE: What do you conceive to be the object of putting alum into bread?—The object of the bakers I do not know; I can state what its effect is. Its effect, by decomposing a portion of gluten, whitens the bread; it also renders the bread a little shorter; it breaks more easily; the glutinous matter being partially neutralised, the bread breaks more easily, and has a better appearance; but the beneficial action of alum upon bread is this, it prevents mouldiness. If you bake a loaf without alum, in consequence of the gluten remaining undecomposed, it sooner becomes mouldy in a damp situation. If you put a small quantity of alum into it, you can keep your bread in a damp place without the risk of it becoming mouldy.

Have you tried the difference between bread made with alum and without?—Yes; it is a well-known fact that alum is continually put into the common paste which printers use, to prevent its becoming mouldy.

You believe that the application of alum to flour has the effect of whitening bad or dirty flour?—I think it whitens any flour.

CHAIRMAN: In that case, inferior flour may be passed off as superior flour simply by the admixture of alum?—The quality of the bread is improved, whatever be the kind of flour which is employed.

A person having a quantity of flour of a bad colour, may sell it for superior flour, and at a higher price, by mixing alum with it, in consequence of that alum making it white, and of a better appearance?—That would be so if you prevented the person who uses the better flour from adding alum too; but he would have the same power of raising the quality of his bread.

In fact, a man may impose upon a purchaser by leading him to suppose that he is purchasing bread made of a better quality of flour than he is actually doing?—It has the effect of increasing apparently the value of the flour.

Have you ever subjected any specimens to this test? have you macerated bread in water, and then tasted the water?—Yes.

Did you by that means detect the presence of alum?—No. I wish to observe, that in the evidence there are two modes of analysis stated, but I am convinced that the parties ought to have known better than to have given those modes. I wish, for example, to refer to Question No. 2123; you will there find a mode of detecting alum in bread described, which consists in macerating it in cold water, and then you are told that by adding ammonia to that water you get a precipitate of alumina; the precipitate, however, need not necessarily be alumina; something more is required; and if you will allow me, I will show you that. I have here two solutions [producing the same]; one contains alumina, and the other contains phosphate of lime dissolved in it; and I may remark, that phosphate of lime is a necessary constituent of flour, and if flour did not contain phosphate of lime, it would not be so well qualified for food as it is; it would not contain a very important element which is necessary to perfect the whole body, and it would not be so fit for food. One of the actions of alum is to render that phosphate of lime more soluble, and therefore I should feel inclined to suppose that it has in that respect a beneficial action. I cannot say at this moment which of these two is phosphate of lime and which is alumina; this [another bottle] contains a solution of common ammonia; these fluids therefore really represent water in which bread has been steeped, except that, as I shall afterwards show, there is no alumina capable of being removed from the water by those means. If I now add an excess of ammonia to these, you will see that I shall get a precipitate which will be extremely alike in the two cases, so much so that it will be impossible for any person, by the eye, to say which is which; but I have a means of determining which is which, and that, by the evidence, you are not instructed in; you are not told anything about it. Now, a person who had obtained a precipitate, here says that is alumina; but it is necessary to use another test for that. In fact, a man who was a good chemist would not have used this test at all. However, having got into a dilemma of this kind, I can get out of it again by ascertaining which is alumina; because now the precipitate you see here will be dissolved by a solution of potash in the case of the alumina, but it will not in the case of the phosphate of lime; therefore I shall now be able to determine which is which. Having now added the solution of potash, I know this to be the alumina at once, for the precipitate has disappeared. The committee will see that, upon adding the solution in the same way to the other, I shall have a precipitate which remains constant.

The object of your experiment is to show that the answer to this question in the evidence is utterly fallacious?—It is; and therefore I think, unless I am to suppose that the report is incorrect, the person who gave that answer did not know how to analyse bread.

The witness was asked, "Can you suggest any simple means by which the public could detect alum in their bread?" and then he gives this as a simple means of doing it?—I think a person who understood the subject would not so have deceived the committee; for at the best it is a deception of the committee, and it is misleading the public. Something of the same kind will be found at Question No. 568.

Mr. Peacocke: Cannot you, by the test of taste, after the maceration of the bread, detect the presence of alum in the water?—Certainly not; I have not been able to detect any alum in the water derived from the maceration of bread.

What amount of heat would it require in baking to expel the water from the alum?—If you will allow me I will show you that immediately, because that has reference to another question of great importance. I only wish now to turn the attention of the committee to No. 568, where there is a similar description of a mode of detecting alum in bread, which is liable to the same fallacy. The inference is, that there must have been a disposition to mislead the committee, or else the person was not acquainted with the proper mode of detecting alum.

Chairman: You dispute the conclusion at which the witness arrives?—Yes. The committee will find at No. 536 an assertion which, I think, must also be incorrect, and I wish to show that it is so. I can show that at the mere heat of boiling water alum ceases to be a solid.

Mr. Peacocke: By the application of an amount of heat sufficient to withdraw all the water from the alum, would not the loaf be burnt to a cinder?—The question I understand to be, whether a temperature which would destroy the crystallisation of the alum would not be high enough to char the vegetable matter of the bread?

In the ordinary process of baking, would the water be wholly expelled from the alum?—The whole of the water would not be expelled from the alum at that temperature.

Mr. Moffatt: Then the alum would still remain in the form of a crystal in the ordinary process of baking?—No, it would not be a crystal. I have actually put crystals of alum into different parts of a loaf, and then had the loaf baked, and I have found it impossible to see with the eye any crystal of alum remaining.

It has, in fact, become completely absorbed?—Completely decomposed and absorbed into the substance of the bread. The operation of the heat has been to liquefy the alum, and cause it to be absorbed by the farinaceous particles.

The result of your evidence upon that question is, that it is impossible that the crystals of alum can exist in bread after it has been baked?—Yes, quite impossible.

Would there be any possibility of the dissolved particles of the alum reuniting, and forming crystals in the bread?—It would be quite impossible.

Mr. Wise: How many loaves do you think you have purchased with a view to these inquiries?—I have purchased a great many, and I have purchased them at 78 different shops.

What have you paid for those loaves?—The half-quartern loaf has been sold for from about 4d. to 6d.

What have you yourself paid for a 4 lb. loaf?—The price I have paid, I think, has varied from 8d. to 9d.

Did you ever buy flour?—Yes.

What did you pay a pound for the flour?—I have bought flour by the half-quartern; I think the flour has cost me about 3d. a pound.

Can you suggest to the committee how it is that a baker who sells a loaf manufactured, weighing 4 lbs., having had all the trouble and expense of the manufacture, and who must also obtain a profit, can sell a 4-lb. loaf for 1d. less than he sells 3½ lbs. of flour for, upon which he has bestowed no trouble whatever?—The 3½ lbs. of flour would make more than 4 lbs. of bread; a sack of flour, which weighs 280 lbs. of flour, ought to make from 92 to 94 quartern loaves. That is allowing for the amount of water which is necessarily absorbed into the bread in the manufacture of the bread.

How much bread would a pound of flour make?—It generally increases in weight about one-third.

Does not this application of alum to flour enable a baker to use a great deal more water?—I rather suspect not; I very much doubt it.

Chairman: You do not think, then, that bread containing alum holds more water than bread not containing alum?—I should think not; in the proportion in which they use it, I cannot see in what way it should produce that effect.

From your own investigation, can you distinctly deny such an allegation?—From practical experience, I cannot answer that question, of course.

You do not think it would, but you cannot speak from actual experience?—Chemically speaking, and speaking from the little knowledge I have upon the subject, I should say it would not. I cannot see why it should.

Mr Wise: Suppose you take two slices of bread, one from a loaf which does not contain alum, and the other from a loaf containing alum, and you put those two slices into saucers, do you not think that the bread containing the alum will absorb more water than the other?—That is a mechanical effect; it would depend entirely upon whether the bread be of a spongy nature or not. If you happened to have bread which was very sad, as it is called, or very close grained, it would not absorb water readily.

Suppose there were bean or pea flour added to it?—I have no doubt it would increase the absorbing power.

Chairman: Are you aware that Baron Liebig has given an opinion to the effect that the use of alum in bread is very injurious?—That is quite possible; he has probably not investigated the circumstances, which, I think, I have been the first to make known, that the alum is decomposed. He argues upon the supposition that the alum remains; and all the arguments I have yet seen are founded upon the supposition that the alum is swallowed, and an astringent effect is ascribed to it. That would be true if the alum remained. No doubt there is a decomposition of it. It is like the case of the bi-chloride of mercury, which is a poison; but, when mixed with the white of eggs it ceases to be a poison.

If I understand your evidence rightly, you would consider that the present law, which forbids the admixture of alum with bread, is an unnecessary restriction?—No; I think that laws may be made in that way which may be applied in severe cases.

What do you call severe cases?—Cases in which more than what I would call a beneficial quantity is employed.

Would it be possible for the law to state what is a beneficial quantity?—I do not see the difficulty in a case of that kind. We have many cases, I think, in which it would be found that the law, if rigidly carried into operation, would interfere sadly with the industry of the country.

Have you had your attention called to recent cases which have occurred of the adulteration of flour?—I have seen them stated in the newspapers.

Have you formed any opinion as to whether those cases were cases in which the law ought to interpose?—There being a law at present existing upon that subject, I do not think it is one which requires to be altered.

That law strictly prohibits the use of alum?—Yes, it does.

Are you of opinion that alum ought to be strictly prohibited?—I think if it existed in such quantities that you could detect it by infusing the bread in water, you might say that it was carried to an injurious extent, and you might prosecute the party; but when water will not extract any alum from the bread or flour, alum being quite a soluble substance, I do not think it is a case for the interference of the law.

You do not think it desirable to interfere to prevent a person being defrauded by being led to purchase flour of an inferior quality, supposing it to be of a superior quality, in consequence of its being mixed with alum?—I do not know how he could ascertain that in respect of the introduction of alum when it was baked.

When the flour is still flour, I presume it would not be difficult to say whether there were alum in it or not; if there were alum in it, the object of the introduction of that alum would probably be to improve the appearance of it, and to pass off an inferior flour for a superior; is that, in your estimation, an offence which the law ought to recognise, or would you allow people still to mix alum with their flour, for the purpose of improving the appearance of the flour?—The question is, whether it does not really improve the flour. If it has a beneficial action on the flour—if it renders it more commendable to the eye or to the taste—I cannot say that I think the law should interfere.

Do you think it justifiable to improve the appearance of an article which is not improved in quality, for the purpose of selling it as a superior article to what it really is?—We see that done so continually, that it is impossible to prevent it.

Therefore, your opinion is adverse to any law upon the subject of the adulteration of flour with alum, at all events, because you think the admixture of alum rather a benefit than otherwise?—To a certain extent; if by water you can extract alum from either the flour or the bread, certainly the quantity is injurious, and there, I think, you might interfere.

Lord C. Hamilton: But you think also that it is beneficial to add alum to bread?—At least it will be for others to prove that it is injurious, because it is clear that that is not alum which remains after baking.

Can any introduction of alum improve the natritive qualities of the bread?—If the alum renders the phosphate of lime more soluble, then unquestionably it is an advantage to have it in bread; and, if it prevents mouldiness, that is also an advantage.

Then you decidedly disapprove of a law which wholly forbids the introduction of alum into bread?—I would not have any law which too strictly interferes with the industry of the country. If you follow that out, you will find you must not allow a cook to put burnt sugar into your soup; you will not allow the brewing of porter, because porter differs from ale only in the application of a quantity of burnt or highly dried malt.

Chairman: You would allow persons to add a substance to make an article more commendable to the eye, in order that they may pass it off as a superior article?—I have mentioned two cases in which it is done, and I would not interfere with it.

Do you think it desirable to introduce a chemical agent into an inferior article to make it more commendable to the eye?—Certainly, if the public is not injured by it.

It is deceived, at all events, and pays a higher price for an inferior article?—Not if you generalise the practice; it is only moving a step up in the same ladder: the man who uses the best flour may do the same.

Mr. Moffatt: If all the bakers in London agree to use a little alum in their bread to make it look whiter than the bread in the country, is there any fraud committed on the public?—I do not see that there is.

CHAIRMAN: Is there any fraud in putting alum in the second quality of flour to make it appear of the first quality?—If you prohibit the use of alum in the first quality, there is; but if you can improve the other also in the same way, I cannot see where the fraud exists.

Lord C. HAMILTON: You say there is no fraud, and the honourable member suggests to you that there is none, in the general use of alum. Do you think, if a baker were to put up a notice in his shop-window, that he sold white bread mixed with alum, he would obtain many customers? would a baker, in fact, stick up such a notice?—No; I have seen the notice, "Bread with the gin in it."

Why should not a baker announce to the public that he uses alum?—I do not know that it would do him any harm, for no one doubts that he does.

You think it would be advisable, at least it would not be reprehensible, to ask the bakers to advertise that their bread is a mixture of flour and alum; do you think the public would purchase such an admixture?—The thing is so well known that it would produce no difference, in my opinion.

Take the case of two bakers' shops, and suppose one of them affixed a notice to the effect that he sold bread mixed with alum, and the other living next door, that he sold bread made of pure flour, do you think the public would go to the man who mixed his flour with alum?—No, certainly not. I have no doubt the public would fancy there was something injurious in the alum.

Then it is not the same thing with the public whether they buy bread with alum in it or not?—From the general impression which is abroad, the public, I have no doubt, would prefer going to the baker who did not use alum.

Mr. MOFFATT: If the public were all as well informed on the subject as yourself, do you think that there would be any preference shown by them for bread in which there is no alum over bread in which there is alum?—I can only say that I eat bread daily in which I have no doubt there is a small portion of alum, but I have not the least objection to it. I have found alum in bread sold in other countries as well as in this. Not more than three or four weeks ago, I bought bread in two of the principal streets in Paris, and I have analysed it since I came back, and both those samples of bread contain just the same constituents of alum which the bread here contains.

In the same quantity?—Relatively I saw no great difference.

CHAIRMAN: You say that if the public had the option of buying pure bread in one place, and bread mixed with alum in another, they would go to the shop where the pure bread was sold, and not to that where it was mixed with alum?—They would go to the shop where the pure bread was sold, under existing circumstances, I have no doubt, if the alternative were put before them in that way; at the same time, the public go indiscriminately to bakers' shops now.

Is not that simply because they are not aware of the adulteration which takes place?—I have a difficulty in conceiving any person who is ignorant of the fact that alum is used in bread. That has been so notorious for years, that if a person told me he was ignorant of it, I should be inclined to doubt it.

You do not, in fact, believe that there is any bread made without alum being introduced?—I do not think you will find any in this town, except bread which is made privately.

Mr. MOFFATT: What is the case with respect to the ordinary household bread sold by the bakers; is there any alum in that?—In the case of ordinary household bread, where colour is not an object, you may find it without alum.

Mr. WISE: Do you like the French bread?—Yes.

I understand you to say you could not discover any difference between the bread which you bought in Paris and bread bought in London?—Mine was not a quantitative, but only a qualitative, analysis; but, judging of the relative quantities of white precipitate by seeing it, I should say there was no difference worth mentioning.

Do you think that the Council of Health at Paris are of your opinion, that alum is not injurious to health?—I cannot say what they think upon that subject; I can only relate the fact which is within my own knowledge.

Mr. MOFFATT: Is alum used by the bakers in the rural districts of this country?—That I cannot say.

You are aware that country bread is not so white as it is in London?—It is not.

The main advantage of the use of alum, I understand you to say, is that it makes the bread look whiter?—Yes, and it also gives a certain firmness of character to the bread; I have no doubt that, by coagulating the albumen, it gives firmness to the bread.

And it is not injurious to health?—I think not; at all events if it be, it requires investigation; it has hitherto been looked at upon the assumption that it is alum, which I entirely deny.

CHAIRMAN: You think a law preventing the admixture of alum with flour is not necessary?—That is a different thing; you use flour for many other purposes besides making bread.

As applicable to making bread, you think it is not necessary?—Within certain limits, I think it is not injurious.

Mr. MOFFATT: If a considerable per centage of alum were used, would not it impart a considerable flavour to the bread?—If you put 500 grains to the quarten loaf, which is what I have done, it is perfectly impossible to eat the bread, it becomes too sour; bi-sulphate of potash is a singularly sour thing.

So that any serious admixture of alum would be detected?—Certainly.

And therefore the public palate would protect itself?—I have great faith in the public palate; and, if the committee will allow me, I will relate some cases which have come within my own experience, to show that it may be depended upon.

CHAIRMAN: You do not mean to say that the public palate would always detect this adulteration?—No; but the lower orders in particular have a perceptive power which is quite astonishing.

You do not probably apply that universally; you would not say that the palate of the lower classes can detect the presence of Scheele's green in confectionary?—Those are substances which are insoluble, and which have no taste.

Lord C. HAMILTON: If the habit of introducing a larger quantity of alum obtained, would not the public taste become so accustomed to it that the practice might grow?—No; I think you have got to the extreme limit already.

You may fancy so now, because the practice is checked by the law; but if the law were repealed, and everybody might cater as he pleased to the public taste, might not the public taste be modified as to lead persons to like that bread?—I think it will be time to legislate upon that subject when the event arrives.

CHAIRMAN: The public taste has shown itself already in favour of exceedingly green pickles, whereas exceedingly green pickles are very poisonous; would you trust to the public eye in that instance, as you would to the public palate in the other?—Pickles are a sort of exceptional thing; they do not obtain much among the lower classes.

They are used by the higher classes?—Certainly; but there ought to have been an amount of intelligence among the higher classes which should have taught them the danger of green pickles. I will state cases showing that the perceptive faculties of the lower orders are very strong indeed; I have seen examples of it in manufactures. For a considerable time I occupied a position with Messrs. Hawes, the large soap manufacturers. In the process of manufacturing soap, it is of considerable importance to know when the process is finished; in other words, when the combination of the grease and the alkali is complete, because you may go on boiling after that wasting your time and doing harm to the soap; that cannot be determined by the eye. I was compelled, when I first went to that kind of employment, to resort to chemistry for it, and it required something like half an hour for me to determine when the whole combination had taken place; but I found among the common men they could take up a portion of the soap, and squeeze it in their fingers, and then taste it; and in that way they could determine in two or three seconds that which required half an hour's trouble by chemical analysis in my case. I afterwards ascertained what this was, and ultimately I was able to determine the same thing; I found it was merely the power of taste which those men had acquired. Again, in another instance, I was employed in the dyeing of hats; certainly up to that time I always thought I knew a black hat when I saw it, but when I went into the manufactory the men were able to show me two hats which appeared to me equally black, but they said one is black and the other is not; it required three months before I was able, by almost daily practice, to determine which was black and which was not; and since that time I have seen very few black hats. I state this to show that their perceptive qualities are very great. In respect to beer, in particular, many of those men would tell you very correctly indeed what brewer has brewed a particular sample of beer.

Have you also turned your attention to the adulteration of beer?—Yes, I have. In respect to beer, I have had considerable experience in the manufacture of the article, and I can only say that in the large breweries it seems quite impossible to adulterate beer. There are so many people about, and the excise officers come in so frequently, that it would be quite impossible to effect any adulteration there. As regards the publicans, I believe that the only thing they add to the beer is a small quantity of coarse sugar; that they invariably add; that is for the purpose of freshening up the beer, in fact, and promoting a refermentation of the beer. The brewer, for his own safety, is compelled to keep it in what is termed a flat condition, and if it were sent out and sold in that state, the public would not drink it.

Mr. MOFFATT: Do they add water to the beer?—I should think not; they may add a little, but very little.

CHAIRMAN: Your opinion is that burnt sugar is the only thing they add?—Not burnt sugar, but common coarse sugar.

Mr. MOFFATT: How is it applied?—It is dissolved in the beer, and the beer is left for two or three days to begin to ferment. The profit the publican derives from that arises from this circumstance, that the beer, in a proper healthy state of fermentation, when drawn into a pot by a machine, is so full of gas that it is impossible to fill the pot; with beer in a good condition, from a gallon you may draw perhaps five pots; you cannot get more into the pot than four-fifths of the proper quantity; so that the publican's profit is derived from that.

Have you examined many samples of beer?—A great many.

And have you universally found no admixture but sugar?—I have not noticed anything, except that in ales I have noticed what I had no doubt was an infusion of bitter orange peel; it communicates an agreeable bitterness to the beer in which it is used.

CHAIRMAN: You are aware that it is in evidence before the committee that a number of other articles are used?—I fancy that those may be exceptions, but certainly the general rule is as I state.

You have never, as I understand you, detected quassia, gentian, or *cocculus indicus*?—No, and I do not believe any of those articles can be detected; you may guess at them, but there is no chemical means of detecting them.

Supposing you do guess, you guess that there are no such things in beer?—I think in ales there is adulteration; that is, I have suspected, from the intense bitterness of some of the ales, that it could scarcely be altogether hops; but it is only supposition; I have no proof.

Mr. MOFFATT: You have not analysed them?—It is impossible; I have attempted it in a variety of ways.

Do you know any of the purposes to which *cocculus indicus* is applied in this country?—I cannot conceive what it is used for.

You know it is imported?—It is, largely.

In larger quantities than it used to be?—Yes; I believe the consumption is increasing. I can scarcely conceive a motive for putting it into beer myself.

Mr. MOFFATT: What would be its effect? The effect of beer is not immediate, but the effect of *cocculus indicus* is very rapid. A person drinking a certain quantity of pure beer would not, from the alcohol, experience any sensible effect for a considerable time; but if it were mixed with *cocculus indicus*, he would be stupefied almost immediately.

Mr. PEACOCKE: Cannot you conceive, in the case of a publican who had adulterated his beer with water, that he would be likely to put in *cocculus indicus* for the purpose of adding to it some of that intoxicating power which he had taken out by diluting it with water?—It is such a totally different sensation, that I can hardly think it; provided the effect were similar to that of alcohol, it would be possible; but, as far as I am concerned myself, there is no resemblance between the effect of *cocculus indicus* and alcohol.

The one has a stupefying, and the other a stimulating and exciting, effect?—With myself it creates an oppression at the chest, and a tingling of the arms, and a loss of power instead of a gain of power.

Mr. COWPER: In this experiment, what quantity of *cocculus indicus* have you taken; you have probably taken it in a diluted form?—I have taken very small quantities, and I began with very small doses, being, of course, very careful about it.

Cannot you conceive that a small proportion of *cocculus indicus* in a pot of beer might produce that heady effect which strong beer produces, without producing the more powerful results you speak of?—No dose that I ever took affected my head in the least; it was confined entirely to the nerves about the chest, and there was a great prostration of strength, which was very sudden.

CHAIRMAN: And you believe the consequence would be the same in most other subjects?—I have not been able to repeat my experiments on others, of course.

Your impression is that *cocculus indicus* does not affect the brain at all?—I do not think it affects the brain in such a dose as I ever took; in a large dose it might affect the brain by its reaction.

Viscount GODERICH: In what form have you taken it?—In small quantities, as an infusion; I have infused it in boiling water, and taken it in small quantities.

Do you consider that, so taken, it would have a similar effect to that which it would have had if infused in beer?—That I cannot say. I cannot think that the effect would be altered by the presence of a small quantity of alcohol.

Mr. COWPER: Have you ever infused a small quantity in beer to ascertain its effect?—No; I preferred to take it pure and simple, to see what its effects were.

CHAIRMAN: You cannot state of your own knowledge what the effects of a mixture of *cocculus indicus* with beer would be?—No.

You do not know what its effect upon the palate would be?—Its effect upon the palate would not be different; it gives a slight astringent bitterness, which would be communicated to the beer.

Not to such an extent as to enable you to detect it?—No.

Mr. MOFFATT: Have you examined many samples of beer in different parts of the metropolis?—I have examined a vast number. I was at one time employed in a brewery.

And the evidence which you have now given has reference to those extensive examinations?—To many hundred examinations.

Mr. SHERIDAN: Beer obtained from publicans?—Yes.

And you never have found anything but sugar mixed with the beer?—I have found sugar, and I have the impression that some bitters have been used; but I could never detect them.

You have examined a great many samples of beer, and you have never found any other substance than that of sugar?—I have never found any direct evidence of the fact. I have been led to suppose that there was something else from the intense bitterness of some of the ales. In porter I have not found anything but sugar.

Mr. COWPER: Will you inform the committee what the tests were which you used in order to ascertain whether quassia or gentian might be found in malt liquors?—I am not able to tell you any test for them. I do not know of any.

Therefore your experience is simply negative; you cannot say that they do not exist?—By no means; I say I have even guessed that quassia might be present in some ales from their intense bitterness, but by chemistry you cannot determine it.

Have you the means by chemistry of detecting any other adulteration besides sugar?—Any mineral adulteration might be detected; sulphate of iron, for example.

No vegetable adulteration?—Not unless it has a very distinct character; certainly none of those which have been mentioned; it would be possible to detect strychnia.

Have you tested for strychnia in bitter ales? Yes; I have never found anything of the kind, nor morphia.

Mr. SHERIDAN: Besides bitter ingredients and sugar, can you certainly say that you have never detected *cocculus indicus*, salt, or water?—I have never detected *cocculus indicus*. As to salt, it is impossible to say whence it is derived. The hops themselves contain a very large quantity of saline matter; and, according to the quantity of hops employed, you have that saline matter increased.

Lord C. HAMILTON: Is not there much beer in which quassia is used instead of hops?—That I cannot say.

Would salt be present, derived from quassia as well as from hops?—No; there is no saline matter in quassia.

Therefore, whenever you found salt, you have attributed it to the presence of hops: can you say that in some of the instances that beer had not been made with quassia insteads of hops?—If I found no saline matter, I should certainly say that hops had not been used.

Whenever you found salt you assumed that it must come from hops, without ascertaining whether quassia had been used instead of hops?—No; I say I cannot determine whether it has been put in, or whether it has come from the hops.

Have you ever bought beer or porter at the brewery, ascertaing its composition, and then bought beer from the houses which were supplied by that brewery, in order to ascertain the difference?—I have repeatedly done that; in fact, it is the usual mode of ascertaining by the brewers themselves whether a man is doing his business honestly or not; it makes a great deal of difference to them, because they know whether to trust him or not. That was one of the purposes for which I was employed in the brewery in which I was.

You have been employed by the brewers themselves to prevent frauds among their retailers?—That is, to give them this warning, which they know to be an excellent one. If a publican adulterates his beer, the public taste soon finds him out, and he cannot go on.

Mr. WISE: You state it as your opinion that all the porter sold in London by publicans is as good and wholesome as that sold wholesale by the brewers?—Yes, it is as good and as wholesome, and probably agrees better with the stomach than the other would do.

Are you aware, in reference to this point, that while the export and consumption of beer, and porter, and ale in Great Britain increases every year, the amount of malt and hops used is less?—The honourable member is no doubt aware that sugar is allowed by the Exise to be used in the manufacture of beer.

Were you aware of the fact to which I have called your attention?—I would merely suggest that perhaps sugar is coming into use instead of malt.

Mr. MOFFATT: How many years has sugar been allowed to be used in breweries?—Perhaps six or seven, or eight.

Has it been allowed as many years as that?—I am only guessing; I should say that was the outside.

It would be quite possible, if sugar had been allowed in breweries where it was previously prohibited, that that may account for the diminution in the consumption of hops and malt on which duty is paid?—I think you must take that into consideration in drawing any comparison.

What test have you employed to discover whether *cocculus indicus* was in beer or not?—We have no test for it.

You never discovered the bitter taste which *cocculus indicus* imparts?—*Cocculus indicus* has not a very bitter taste; it has an astringent taste, but not greater than the hop itself. I never experienced that effect from any beer which I have drunk, as being that which I knew and could recognise as the effect of *cocculus indicus*.

Viscount GODERICH: You said that the beer sold by the retailers was, in your opinion, as good and wholesome as that sold by the brewers; do you mean to say that you believe that water is not added very frequently to beer sold retail?—You may find small dealers, who are ruined already almost, and are determined to carry on business as they can; but if you go to any of the large dealers in beer, persons who are drawing two butts of beer a day, of which there are a great many about town, they have no time to make these additions; and, in the second place, people in the neighbourhood are so habituated to the taste of good beer, that their houses would be deserted; they can have no inducement to do it; they have an ample profit upon the beer, even selling it as they do.

CHAIRMAN: Do not you think they are sometimes desirous of making the ample profit larger?—There is this limit to it; a man is supposed to have some knowledge of his business, and to know what will do and what will not.

Do you know what the profit is between the retail and wholesale prices of beer?—I know beer is generally sold from 32s. to 34s. a barrel, with 5 per cent. off on payment; that is 36 gallons. That would be necessarily less than 3d. a pot; if it be 36s., it would only be 1s. a gallon. Therefore the publican's beer costs him very little more than 2¼d. a quart. If, however, to that beer he has added a small quantity of sugar, and allowed it to commence fermentation, it is impossible, in drawing the beer, to fill the pot full in reality; therefore, the publican makes six pots out of five pot; now that of itself yields an enormous profit.

Mr. MOFFATT: Thus the public lose in the quantity of beer they buy?—They get a less quantity.

Is not it your opinion that it would be beneficial for the interests of the public to have an act of Parliament passed to prevent the practice of vending beer frothed?—If you could do that it would be protecting the interests of the public undoubtedly; or if you could make the pot a little larger.

Mr. WISE: At what price do the retailers of beer sell this article you have spoken of?—The lowest price I have ever known is 3d., that is, as they say, in their own pots; 3½ is as low as you will buy it in any part of the town.

According to your experience, the publican gets now nearly a penny a pot upon all the beer he sells?—Yes.

Lord C. HAMILTON: You think, therefore, that he would be satisfied with his fair profit, and not add anything to the beer to increase it?—It would be 25 per cent. profit; and, as it is a ready-money concern, I think it is ample.

You think he would be satisfied with it?—I really think so.

You have stated that you know that there is a great deal of *cocculus indicus* coming into the country; can you state to the committee any fair and honest purpose for which that is used?—I do not know of any.

You are a chemist of great practice; cannot you state to the committee any legitimate and fair purpose to which this increasing importation of *cocculus indicus* is applied?—I cannot think of anything at the present moment; of course there are secret processes carried on for various purposes.

Viscount GODERICH: You stated just now, as your reason for thinking that there was so little adulteration practised by publicans, that you did not see any advantage they would gain from practising it?—Not a permanent one.

You do not agree with the opinion of Professor Redwood, to the effect that publicans mix water with their beer for the purpose of concealing their profits from the public?—Of course I do not agree with that; in fact, I would say, of my own knowledge, that it is not so. I have had great experience in this matter, and I suppose Professor Redwood has not.

CHAIRMAN: Is there any other article to which you wish to direct the attention of the committee?—I wish to speak of vinegar; that is said to be very extensively adulterated with sulphuric acid, and no doubt some of the lower qualities of vinegar have been so; but I think that in that respect there has been great exaggeration. I will relate one case which occurred to myself, to show that the editor of the *Lancet* published a statement with respect to vinegar belonging to Messrs. Hill and Evans, of Worcester. They applied to myself and also to Dr. Ure on the subject. They declared there was nothing of the kind in their vinegar, and they brought me a small sample. I tested it in a way which perfectly demonstrates the existence of free sulphuric acid, if there exists only so much as one per cent. In this vinegar I found nothing; upon which they desired me to go down to Worcester, and go through the whole of their works. I did so, and examined their works. They are very large vinegar manufacturers; and I made a calculation from the quantity of oil of vitriol, as it is called, which had been found in their vinegar, that, taking the whole quantity of vinegar they produced, it would require something like twenty-five carboys of oil of vitriol a week to produce the adulteration in question. It would be quite impossible, of course, to have brought anything of that kind into the manufactory without every one seeing it. I found there was not a particle of oil of vitriol on the works. In examining the water of which the vinegar was made, I found it contained an enormous quantity of sulphate of lime. I have no doubt the mode adopted for testing the vinegar was by salts of baryta, and that the sulphuric acid combined with the lime had been taken to be oil of vitriol. I examined the whole of the vinegar belonging to the establishment, and I examined a great many samples from their warehouse in London, and there was no oil of vitriol in any of them. This fact was certified to the editor of the *Lancet*, but he declined to make any apology. They consequently applied to other chemists; I think to Professor Graham, and several others; in fact, they must have gone to an enormous expense, £150 at least. After a time, however, the editor of the *Lancet*, instead of making a proper apology, put in a very bare and meagre statement, to the effect that he found Messrs. Hill and Evans's vinegar was to be exempted from the list of those containing oil of vitriol. These people, as I said, had gone to an enormous expense; and I think, therefore, it ought to teach us how dangerous it is to deal in this way with any manufacturer. I do not question Dr. Hassall's ability, but we are all liable to make mistakes, and a respectable manufacturer ought not to be attacked in this way, and his character ruined by a mistake of this kind; for, if you establish a committee of persons to decide upon these cases, they must be as liable to make mistakes as any other persons; and how is a manufacturer in that case to rectify an error? In this particular instance it cost the manufacturer £150 to do so, and when done, I very much doubt if the mischief caused by the original statement was ever remedied.

What may be your method for testing for sulphuric acid in vinegar, as distinguished from that which was employed by those who wrote in the *Lancet*?—The process I adopted upon that occasion was a very simple one. I have here two samples—one containing about one-half per cent. of sulphuric acid, and it will be seen, by only exposing a single drop of this upon a little plate, at a steam heat for five minutes, the vinegar containing the sulphuric acid will become perfectly black, and the other which does not contain it will remain uncoloured. A small white plate is put over a vessel containing water, and the water is made to boil, so that the steam plays against the lower part of the plate. Under these circumstances, take a single drop of the suspected vinegar, and drop it upon the plate; if it contains oil of vitriol, the vinegar will evaporate, and the acid will concentrate till it is sufficiently strong to act on the organic matter of the vinegar, on which it acts and chars it. If it contains no oil of vitriol, it only evaporates, and leaves a yellow stain. That, however, is only a test to prove whether there is sulphuric acid present; to determine the quantity we must make an analysis, which is more difficult.

You think there are other methods which would lead to mistakes, provided sulphate of lime was in the water?—Unquestionably so.

What is your opinion upon the general subject of adulteration?—I gather from what you have said that you think bread and beer are not adulterated at all, or only in such a way as not to be injurious to the public health. Is that the conclusion at which you have arrived in regard to articles of food and drink generally?—The committee has mentioned the case of pickles, which I thought was notorious, because it is stated in every chemical book; every chemical book will tell you that if you put an iron knife into pickles, and it becomes coated with copper, the pickles are not fit to be eaten.

Putting aside that exceptional case, do you think that articles are sold generally in a pure state?—Excepting confectionery, taking the great mass of the food which the public eat, I have never met with any instance of disease caused by any kind of food being adulterated.

You do not think that cayenne pepper is ever adulterated with red lead?—I have not seen a case of disease brought on by it. If cayenne pepper is adulterated with red lead, as possibly it may be, that ought to be stopped, of course. I have no question that there ought to be legislation upon this matter; but I think it ought not to interfere with the industry of the country.

Have you in your own mind any plan by which such matters might be investigated without an interference with the industry of the country?—In the case of flour and in the case of beer, if anything is found in them which is injurious, you may summarily prosecute the man. He may be brought at once before the magistrate and punished, and I think that is sufficient.

Would you recommend a law giving a similar summary power in the case of the adulteration of other articles?—I think I would recommend an extension of the same law; it works very well, as far as I see.

How is the law in reference to adulteration to be put in practice?—I see instances of its being so stated in the newspapers, that under the present law parties can be brought up summarily and punished.

You see no objection to a similar machinery for the purpose of checking adulterations in other articles?—In any article, in fact, which is proved to be injurious to the health of the public.

Mr. Wise: Are you aware of the loss of time which a poor man would have to undergo in a case, for instance, of his buying bad flour?—I am not; but I think you cannot be too cautious when you have the character of a respectable man to deal with. In the case of tobacco, the Excise formerly exercised a power of this kind; and I know many cases in which it was improperly exercised; for instance, I know a case in the City, in which I was engaged. A most respectable tobacco-manufacturer had a servant with whom he had a quarrel. Now, it is not allowed to introduce sugar into tobacco. Good tobacco contains sugar naturally, but you must not introduce it, according to the Excise regulations. However, this man, who probably had never mixed anything with his tobacco in his life, was seized upon one day by the Excise, and a quantity of sugar was found in his tobacco; you could take it up with a spoon. There was no defending such a thing, and all he could say was, that he had not put it there, nor had it been put by his will, and he was satisfied that there had been some collusion.

Mr. Moffatt: Was there any sugar found in the manufactured tobacco on his premises?—Not any. He was fined very severely. It was afterwards however, demonstrated, that this man whom he had quarrelled with had communicated with the Excise, he himself having put the sugar upon the premises. I will relate another example in which the Excise themselves committed an error. That was the case of a tobacco-manufacturer at Gloucester. I was summoned to go down to Gloucester to defend that case. The assertion was, that the man had put liquorice into the tobacco; the quantities they pretended he had introduced were very small; they admitted that they had no chemical test for it, and they admitted that they had not employed the microscope. The magistrates at last compelled them to say how they found out that the substance was there. To the amusement of every person there, they declared they smelt it. Now, there could not have been more than fifteen pounds of liquorice in the whole manufactory, and there must have been many tons of tobacco; and when you recollect the strong odour of tobacco, and that liquorice has scarcely any smell at all, the magistrates very justly said at once, "We cannot entertain the charge." In other cases, however, parties have been condemned upon quite as little evidence as that.

Great injustice is, in your opinion, frequently done by the rigid interference of the Excise with the assumed or asserted adulteration of tobacco?—I am certain of it.

Lord C. Hamilton: It appears from your statement that the Excise only depended upon the same means of detection, viz., the evidence of their senses, which you have suggested would be sufficient for the public according to the illustrations which you have given in the case of soap and the colour of hats?—I would not recommend a prosecution upon such a test as that. Here you had a man's character at stake, and his money too; and, though that person was successful, it put him to enormous expense. The Excise threatened to throw the case into the Court of Exchequer, and would have done so had not the *Daily News* taken up the matter, and remonstrated about it.

Viscount Goderich: Did I understand you rightly to say that you have been employed to give evidence in cases of suspected adulteration?—I have generally been employed against the Excise.

In favour of parties accused of adulteration?—Yes; wherever I have found the case an honest one, I have given evidence; but I have repeatedly refused to do so. When I have found that the man was really adulterating, I have always said, "You must compromise this; there is nothing to be done;" and I have met with many such cases.

In what instances?—In tobaccos in particular.

Mr. Sheridan: In what other articles?—In tobaccos chiefly; certainly in some other things.

Will you mention the other articles?—I have known pepper adulterated.

Viscount Goderich: What substances have you found in it?—Chiefly farinaceous matter, such as starch or powdered rice.

Mr. Moffatt: Matters not prejudicial to health?—No.

Mr. Sheridan: And not advantageous to the public?—Not to the public revenue.

Mr. Moffatt: Were they disadvantageous to the public health?—They would do neither harm nor good. I believe the addition of a small quantity of sugar to tobacco is an advantage: the best tobaccos always contain sugar.

Viscount Goderich: You mean to say that an inferior quality of tobacco mixed with sugar would be equal to a superior quality of tobacco?—They are able to sell it better, and therefore one would infer that it looks better; and I dare say sugar does communicate good qualities to it; it brings it nearer to the natural standard.

Mr. Peacocke: You have never detected any other description of adulteration in tobacco except sugar?—Yes, I have detected nitrate of potash.

Mr. Kinnaird: What is the effect of nitrate of potash?—Nitrate of potash, I apprehend, is for the purpose of making the tobacco burn better.

Has it any deleterious effect?—No; there is nitrate of potash naturally in tobacco: good tobacco always contains it.

Mr. Peacocke: What else have you found?—I think I have detected some of the salts of ammonia; sal ammoniac I have detected, which ought not to exist in tobacco. I have also detected some leaves of improper plants, such as the common garden rhubarb.

Do you know the plant called the calves' plant?—Yes; I have not detected that.

I am told that in some counties it is cultivated for the purpose of putting with tobacco?—It is sometimes smoked alone.

Have you frequently detected the leaf of some other plant?—I have detected the rhubarb and the coltsfoot to some extent.

Could they be detected by the eye?—No; I only detected it by the microscope. The hairs upon tobacco are so peculiar, that you can readily see what is not tobacco, and then, by comparing it with other samples, you discover what it is.

Have you found spurious leaves in cigars?—No; I have examined cigars very little.

Have you extensively used the microscope for the purpose of detecting adulteration?—Yes, for years.

Mr. Wise: You said that you thought the public are amply protected by the 6th and 7th of William IV., with regard to the adulteration of flour; are you aware of the trouble which it gives to any person to prosecute under that act?—Whatever the trouble may be, I think the responsibility you cast upon the individual is so great, that I should hardly think of diminishing the labour.

Suppose a poor man brings flour to me, and I have it analysed, and find plaster of Paris in it; do not you think that it would be much better for me to be able to refer that poor man to a public inspector, or a public prosecutor, than that he should himself undertake to prosecute the miller, and obtain a search-warrant to search the premises?—I do not think I am qualified to deal with legal questions myself.

Would it not be better to have a public inspector, who should be able to go the mill, and look at the flour, and hear the complaint of any poor man, than to leave the poor man to go to a justice of the peace, lay an information, and get a search-warrant, which would take two or three days of the time of the man who prosecutes?—In that case, perhaps some other plan might be adopted; but I do not think that I could enter into that subject. I have found it to be a most serious thing to have the character of a large manufacturer interfered with; the news spreads rapidly that something has gone wrong.

Do not you think that if a man sold plaster of Paris mixed with flour, he should be punished?—That depends upon whether he put it in, or it had got in in some other way without his knowledge.

Supposing you found 20 or 30 sacks of plaster of Paris in a mill?—I would submit, that in the case of a man who has two bad coins in his pocket—which a man may have quite unconsciously—it would be rather hard to drag him up and condemn him at once.

Do not you think it would be a very suspicious circumstance if you found several sacks of plaster of Paris in a flour-mill?—That depends upon whether it were wanted for the purposes of the mill. I can easily conceive that a miller might require plaister of Paris.

For what purpose?—For plastering. If, indeed, I found a particular quantity of sulphate of lime of a very fine quality in a flour-mill, I might assume that it was there for a bad purpose; but a man would not use the common description of plaister of Paris to mix with flour.

Do not you think it would be a great protection to the public if, in the metropolis, or in the large provincial towns, there were certain inspectors appointed, who should be in communication with the Board of Health, who could from time to time, when they thought that adulteration was practised, interfere for the purpose of its being exposed and punished?—I see no objection to that; but I would point out that even the Excise, which is the only thing of the kind which we have in this country, has, to my own knowledge, in several cases committed gross injustice—sometimes inadvertently, and sometimes, it would appear to me, from ignorance. If you had a public prosecutor of that kind, at any rate let the manufacturer, if he is found right, recover his expenses from him; but in the case of the Crown that is not so now. If a man has an action brought against him, he may be proved to be perfectly innocent, but he has no remedy for the expense to which he has been put, the Crown paying no costs.

If a public prosecutor were appointed, do you think it would have a beneficial effect in preventing adulteration?—It would calm the public mind, and there would be no objection to have such a person, if you can regulate his proceedings so that he shall do no harm.

If an analysis is made of an article, how can the person be injured?—The question must arise, having found the material in the flour, how did it come there? had the miller a guilty knowledge of it?

Who could put into the flour but the miller?—I have shown one case in which sugar was put into tobacco, where I am convinced that it was not put in by the man himself. The manufacturer, therefore, will be left to the mercy of servants, and a malicious servant can ruin his master at any time.

I gather from your evidence, that you think the appointment of a public prosecutor, who might look after these adulterations, would be beneficial to the public?—Yes, if his functions are so regulated that he can do no harm, and if he were made responsible for the proceedings in case it was shown that they were groundless. In case the public prosecutor brings an action against a man, and puts him to expense, and so on, let the man have power to recover those expenses.

Would you draw any distinction between adulterations simply of a fraudulent character, and those which are positively injurious to health?—I would. I would make a difference in the amount of the fine or the length of the imprisonment. I think adulterations which are injurious to health could scarcely be too severely punished.

Mr. Moffatt: The Excise have extensive powers in dealing with the adulteration of tobacco, have they not?—At one time they had too great power.

Have those powers lately been modified?—The fact is this, that I think the Excise have seen that they could not carry out their views; and since the *Daily News* took up the matter, they have been very quiet. I notice that Mr. Phillips, in his evidence, says, he does not think there is any adulteration of tobacco just now; and I do not know that there is any great difference between the present time and formerly.

Is it within your knowledge that there have been many instances in which complaints of adulteration have been made, but, on an inquiry being

instituted, they have not been sustained?—A vast number of them were not sustained.

In those cases, was great injury inflicted upon the persons so accused by the Excise?—Unquestionably.

It was a circumstance of permanent injury to a tobacco manufacturer to be accused by the Excise of adulterating his tobacco?—Unquestionably.

And he had no remedy for that wrong?—None whatever. To show how mistaken the Excise may sometimes be, I will mention the case of a highly respectable brewer in this town, who wished to export ales. In order to export ales they must be brewed of a certain strength, or you do not get the drawback. This brewer was determined to brew an honest article, and he brewed it of exactly the proper strength. Now it is the custom in the trade to brew a little stronger than the proper strength—of course, I suppose, to make allowance for the clumsiness of the Excise. In this instance the gravity of the ale was precisely that which would enable the brewer to recover a small duty. However, the barrels of beer were sent to Liverpool, and a great many there were of them; I believe as many as 1600 barrels of beer. They were tested by the Excise. The Excise said, this is not strong enough, and we will not allow the drawback; there is some half pound or something wanting. The difference was very trifling, and we suggested that perhaps the mode of analysis they had used might not be sufficiently accurate to determine it. W offered to give them proof from our own brewing-books that the wort was of the proper strength at the time it was brewed. The contest went on, and it seemed as if it would never have an end: but, after fourteen or fifteen months, they returned the drawback, having found that they were wrong.

CHAIRMAN: I understand what you desire to show by your evidence at the present moment is, that great caution should be exercised before any proceedings are taken against persons on mere suspicion?—Certainly.

You probably think that that does not obviate the desirability of some measure being adopted to prevent and punish adulteration, provided means are at the same time taken to prevent the occurrence of oppression and injustice?—Certainly.

The views put forward by Mr. Thompson in this evidence have created considerable sensation in certain quarters, and have been made the subject of a "leader" in the *Times*, and given rise to the following correspondence:—

LIEBIG ON ALUM IN BREAD.

TO THE EDITOR OF THE "TIMES."

Sir,—In connection with the leading articles in the *Times* of yesterday, it may interest your readers to be made acquainted with the nature of the objections entertained by Liebig to the adulteration of bread with alum.

Liebig states that alum hardens the gluten of wheat flour; that the phosphates of that flour, and which are among its most important constituents, are decomposed when it is used, an insoluble phosphate of alumina being formed, the benefit of the phosphoric acid of the phosphates being thereby lost to the system; that the formation of this compound accounts, in all probability, for the greater indigestibility of English bread; and, lastly, that, by the use of alum, the baker is enabled to convert sour and damaged flour into bread of apparently good quality.

In one of the baron's letters on chemistry—that in relation to bread and flesh—these passages occur:—

> The bakers in Belgium discovered, about twenty years ago, how to bake from damaged flour, by adding sulphate of copper (a poison) to the dough, a bread in appearance and external properties as beautiful as from the best flour. This mode of improving its physical properties of course deteriorates its chemical properties. Alum has the same effect as sulphate of copper,
>
> Since phosphoric acid forms with alumina a compound hardly decomposable by alkalies or acid, this may, perhaps, explain the indigestibility of the London bakers' bread, which strikes all foreigners.

It thus appears that Baron Liebig's views as to the objectionable properties of alum in bread are not based, as stated by Mr. Lewis Thompson in his evidence before the Adulteration Committee, "upon the supposition that the alum remains" in the bread, and that it is swallowed as alum.

Liebig's reputation as one of the first chemists in the world entitles any views which he may entertain on a chemical question to the highest consideration. One useful lesson may at least be learnt from his views in regard to alum, namely, that it is a very dangerous thing to tamper with a prime article of consumption like bread, by the introduction of chemical salts and substances of any kind, since these may possibly affect, to a serious extent, its properties as an article of nutrition.

I remain, Sir, your obedient servant,

ARTHUR H. HASSALL, M.D.,
Author of "Food and its Adulterations."

Bennett Street, St. James's Street, Aug. 22.

ADULTERATION OF FOOD.

TO THE EDITOR OF THE "DAILY NEWS."

SIR,—As I have appealed in vain to the sense of fair play of the conductors of the journal to which the enclosed letter is addressed, I am obliged to appeal to you to aid me in bringing it before the public.

LEWIS THOMPSON.

TO THE EDITOR OF THE "TIMES."

Sir,—Your correspondent, "Arthur Hill Hassall, M.D." &c., seems desirous of proving that Baron Liebig has been for some time past aware of the decomposition which ensues when wheaten flour and alum are mixed together and made into bread, and moreover that he (Liebig) has published this fact in certain letters. In support of this assertion, Dr. Hassall quotes a passage from the said letters, which does not, however, in any way that I can see, establish the correctness of the above conclusion; but, as it answers my purpose extremely well to admit the validity of such a deduction, I willingly accept Dr. Hassall's dictum, and on his authority take it for granted that Liebig has pointed out the decomposing action exercised by wheaten flour upon alum.

But when Dr. Hassall tells me that Liebig asserts "the phosphates in wheaten flour are decomposed by alum and converted into phosphate of alumina," I must be permitted to demur, because Liebig cannot be ignorant that alum does not decompose the phosphates of lime and magnesia, which constitute about 99 per cent. of the "phosphates in wheaten flour;" neither do I believe that Liebig would use the expression, "hardly decomposable compound," in reference to the phosphate of alumina, except in some specific sense not included in the quotation; because phosphate of alumina is even more easy of decomposition than phosphate of lime: thus, when dissolved in diluted nitric acid, it is decomposed by all the soluble salts of lead; and when dissolved in tartaric acid, and so far super-saturated with ammonia, it is decomposed by all the soluble salts of magnesia—the last being, in fact, Otto's mode of analysis for this substance. Nor is it likely that Liebig considers "alum to have the same effect as sulphate of copper;" for assuredly this latter salt can never generate the much-dreaded "insoluble phosphate of alumina. I am however, as before said, quite content to adopt Dr. Hassall's view, that to Liebig belongs the merit and priority of observing the mutual decomposition of wheaten flour and alum when made into bread, and under the ægis of that authority I claim the "prestige" of Liebig's name to prove that none of the witnesses who so confidently declared to the parliamentary committee that they "had extracted alum from bread" could possibly have done so. Dr. Hassall shows that they were all deceived, not excepting even the gentleman who "saw crystals of alum as large as peas in the bread:" what they extracted, and what he saw, was either "hard gluten or phosphate of alumina," or both, according to Liebig. In my opinion, it was phosphate of lime which they mistook for alumina.

One thing, however, is clear—that these witnesses were as ignorant of the discoveries of Liebig in this particular as I was; and it may be taken for granted that, had they read the letters of Liebig, as Dr. Hassall reads them, nothing would have been heard of the extraction of alum from bread; and it will readily be believed that I, for my part, would gladly have availed myself of Dr. Hassall's translation, when before the committee, in order that the great name of Liebig might secure to my argument that respect and confidence which it needed. My object was, not to promulgate a new doctrine, or develope a doubtful theory, but to give the committee the truth, no matter from whence obtained, and thus to originate a provision against a casualty which I foresaw must occur—viz., where an honest trader, having had his goods seized and examined by an incompetent person, was fined in money and damaged in character without just cause. I conceived, for instance, the possibility of a baker falling into the hands of some *diletante* analyst, who, in defiance of Liebig and the laws of chemistry, "extracted alum from bread" whether it was there or not: of course, the unfortunate baker would be fined and disgraced; but, relying upon his own innocence, and having money withal, we will suppose that he calls in Liebig to his aid, who soon demonstrates the ingorant folly of our *diletante* friend, and the purity of the bread, to the satisfaction of the world at large. The question now arises, How is this baker to be compensated for his loss of money, trade, and time, and for his heart-rending anxiety during the investigation?

I believe, sir, you will find this to be the chief point in my evidence; and that such a case has occurred I will now prove to you. But first let me say a few words upon the nature of an answer which has been given to this question. It has been proposed that persons under the circumstances mentioned shall bring "an action for defamation." Now, really, unless this be meant as a satirical joke, I must say it is a barefaced insult to the trading community. "Bring an action," forsooth! As well tell three-fourths of our shopkeepers to creep into a quart bottle, or drink nothing but Clicquot. Where is the money to come from? Now, however, for my case in proof.

Towards the latter part of the summer of the year 1852, a paragraph appeared in a journal called the *Lancet*, to the effect that the vinegar made and sold by Messrs. Hill and Evans, of Worcester, was largely adulterated with "oil of vitriol." The manufacturers in question, fully satisfied of the falsehood of this accusation, and not destitute of hard cash, resolved to demonstrate their entire innocence in a truly English fashion. They accordingly obtained the professional assistance of Professors Graham and Hoffman, Drs. Ure and Lyon Playfair, myself, and I believe some others: the manufactory was thrown open, all trade secrets, as they are called, were revealed; every process was displayed, the vinegar in progress, that in stock, that on sale, were all freely offered for inspection and chemical examination: nothing, in short, was withheld or concealed. The result showed that not one particle of "oil of vitriol" existed either on the works or in the vinegar; but the water from which the vinegar was made contained, as all spring water does, a portion of sulphate of lime: and this it was which the analyst of the *Lancet* (Dr. Hassall will remember) had mistaken for oil of vitriol! Mistaken sulphate of lime for oil of vitriol!!

The affair ended by the insertion of a very costive and meagre apology in the *Lancet*, and the payment of something like £200* by Messrs. Hill and Evans for the scientific testimony needed to establish their character as honest traders. But mark how powerfully the argument returns to our starting point: had the same thing occured to a small maker—to a man commencing the world with a limited capital and more limited credit—what could he have done under the circumstances, or how avert the ruin of his character? "Oh, bring an action for defamation, and ask the editor of the *Lancet* to lend a thousand pounds towards the preliminary expenses!"

In conclusion, I feel certain, sir, that a candid and unprejudiced view of this subject in all its bearings will convince you that the present condition of the scientific world is not equal to the requirements of the occasion, in reference to so important a matter as the detection of what may be called "trade adulterations." The evil, such as it is, which now exists, is small indeed compared with the enormity of that which may result by confiding an arbitrary power of confiscation to impure or improper hands: and how is this to be avoided in a country like ours?

As the phrase runs, "Your answer will greatly oblige," sir, your obedient servant,

LEWIS THOMPSON.

3, Parliament Street, Westminster, Aug. 24, 1856.

PHŒNIX GASLIGHT AND COKE COMPANY.

The Adjourned Half-yearly General Meeting of Proprietors holding, previous to the 20th of May last, five shares and upwards in this company, was held, pursuant to the Act of Incorporation, on Wednesday, the 20th of August, at the Bridge House Hotel, Southwark, for the purpose of declaring a dividend to midsummer last, and on other business.

Mr. J. E. JOHNSON took the chair at one o'clock.

The SECRETARY (Mr. Pridden) read the notice convening the meeting, also the minutes of the last half-yearly court, and of the meeting *pro forma* from which this was an adjournment.

In answer to Mr. JOSEPH BOX,

The CHAIRMAN said, the act of Parliament under which the company's works were conducted required that the midsummer meeting of the proprietors should be held within a certain time after the close of the half year; and, as that did not allow sufficient opportunity for the due arrangement of the accounts, it was customary to hold a meeting *pro forma*, in compliance with their constitution, and to adjourn that meeting till a later period.

The minutes, as read, were confirmed.

The CHAIRMAN said: Is it the pleasure of the proprietors that the report of the directors and the accounts should be read in detail, or will you, as on previous occasions, take them as read, they having been printed and forwarded to each of the proprietors some days before this meeting?

There being a general expression of feeling in favour of the latter course, the report and accounts (which we gave in our last number) were taken as read.

---

* The writer is in error as to the amount, which was nearly £1500.

Mr. GIBBS (deputy-chairman) said, it was now his duty to move that the report of the directors and the statements of accounts be received and adopted. These documents had been for some days in the hands of the proprietors, and one of the leading paragraphs of the former told them that "during the last six months little change in the working of the concern had taken place." So slight, indeed, had that change been, that from an examination of the accounts it would be seen that the items in the balance-sheet tallied very nearly one with another as they had done in former years. Nevertheless it might be useful to point out a little discrepancy in one or two of the charges. The first of these was the article of coke. Although the rental of the company was in a very satisfactory condition, showing a gratifying increase, the proprietors had doubtless observed that there was a considerable falling off in the item of coke. (Hear, hear.) Now, it was not necessary for him to inform the gentlemen whom he was addressing—many of them being gas manufacturers themselves—that a company looked for the principal part of its profits from the coke account; and that, if that were a poor one, it might in many instances affect the dividend. In the present case, it had been compensated for in the increase in the rental; and so far the accounts were satisfactory. But it was likewise his duty to point out to the proprietors that the coke account for the present half year—that was, for the two months so far as they had gone—did not show that improvement which could be desired. The price obtainable for coke was as fluctuating as any commodity in this large metropolis, and sometimes in August it realised better prices than it did in November. The obvious duty of the directors of a company was to sell as fast as they could make it, and submit to whatever result might be shown when the half-yearly balance was made up. The next item in the report to which he would call attention was the alteration in the situation of the street mains, for the purpose of increasing the supply of gas. This had been going on for a considerable time, and had been pursued with great industry and vigilance, on the part of the engineer, during the last year. The company were now deriving the benefit of the course which had been adopted. Some of the old mains had been laid down for twenty or twenty-five years, and were in such a state that they admitted of a large amount of leakage; and these were now being replaced by new ones, or others in good condition which had been brought from districts where they were no longer useful. He believed that by this means a very considerable diminution in the amount of leakage would be the result; and the cost of this work, as was explained in the report, had been paid out of the current half-year's expenses. (Hear, hear.) The next item was a most satisfactory one, and that was the article of "law," which, by a specific recommendation of the proprietors two years ago, the directors were requested to make a distinct item in the accounts, and to which they were, on the present occasion, in the satisfactory position to add the Latin word, "*nil*." (Hear, hear.) He did not see their solicitor present to-day. (A laugh.)

A PROPRIETOR: Perhaps this is the reason why he staid away. ("Hear," and a laugh.)

Mr. GIBBS could not say; but, as an old stager, he might observe, that he did not know the time when he had been away before. (Hear, hear.) Well, then, the accounts, as he had said, were, upon the whole, very satisfactory—so much so, that the directors had felt at liberty to make a reduction of 6d. per 1000 in the outlying or country districts—a circumstance which he believed would be duly appreciated by their consumers. The meeting would understand that, beyond a certain point, the charge made for gas had been 5s. 6d., although the charge in the district immediately surrounding them was but 4s. 6d. It was impossible that they could supply remote parts like Clapham, Balham Hill, and Tooting at the same price as those close at hand; but a reduction had been frequently asked for, and the directors felt they could now comply with the request to the extent of 6d. per 1000. He did not know that he need add more; the report spoke for itself, and he would therefore move that it be received and entered upon the minutes. (Hear.)

Mr. RHODES seconded the motion.

Mr. JOSEPH BOX said he was rather induced to make a remark or two in reference to the accounts, from the manner in which the deputy-chairman had spoken of one of the items, viz., the coke account. It was stated in the report that great attention had been paid by the directors to the working of the concern, and he did not hesitate to say that that was so; but perhaps, after all, there had not been sufficient attention, for he found that, with regard to the coke account, there was a great discrepancy between the present half year and the last.

A PROPRIETOR: Take the corresponding half year.

Mr. BOX would take the last half year first, and then the corresponding one. There had been a falling off in the revenue on the coke account, at the three stations, of £958 in six months. He was quite aware that there had been a difference in the price—a lowering of the price during those six months—but the difference in result was so great, that he had been induced to carry his calculations and investigations a little further than the revenue. He had gone into the figures with a view to see what was the quantity made for sale, and he found a great discrepancy there. Now, the market price of the article could have no effect whatever upon that—not a penny. Perhaps their respected chairman could tell them what the difference was in the falling off in the quantity made—take it, first of all, at Greenwich; because, as he before said, the market price of the article did not at all affect this question. He would himself tell the meeting what the quantity was: it was 132 chaldrons falling off out of 6150 tons. (Interruption, and cries of "It's not worth mentioning.") He was not speaking of revenue—of the amount of money received for coke—but of the quantity made; because a ton of coals would yield a certain quantity of coke all the world over—("No, it won't")—provided the same quality of coal was used; and he had a right to suppose that the directors used the best. Well, then, there was a falling off at Greenwich of 132 chaldrons; but when they came to Vauxhall there was a falling off of 730 chaldrons—making altogether 862 chaldrons. The general principle was, that a ton of coal would yield one chaldron of coke, and one sack of breeze; that was the generally-received opinion. He was not going into the question with any critical nicety as to what this quality or the other produced, but taking the data assumed by all gas engineers as well as by almost all directors of gas companies. Perhaps their respected chairman could throw some light upon the subject. He did not dwell very much upon it, only the falling off in revenue had led him to carry his investigations further than the question of revenue; and, in pursuing his inquiries, he had arrived at this result, which certainly seemed to him to require a little explanation from the board of directors.

Mr. BECK. My friend, Mr. Box, asks——

Mr. BOX: I must beg that the explanation may come from the chair. I cannot admit of any gentleman supplying that explanation, unless the chairman calls upon him for it.

The CHAIRMAN: I have no objection to reply to Mr. Box, but I would rather have left it with the proprietors. I will, however, just refer to a fact or two. Mr. Box says that the revenue is much lower than it was. True—and I predicted this at our last general meeting. When our friend himself was pressing us for a higher dividend, I told him then that we should have a large falling off in that part of the revenue derived from coke, and I anticipated that it would not be less than £2500 for the ensuing year; but the result proves that I completely understated it, for it turns out to be £2500 for the half year only.

Mr. BOX: You are right. It is £2463.

The CHAIRMAN: The price of coke has gone down from 11s. 9d. to 9s. 5d. this half year. So far with regard to the money part of the question. Let me now refer to the quantity. This half year it has been 80½ per cent. on the whole of the coals used, and last half year it was 77¾. (Hear, hear.) I do not know, with such a fact as this before him, how my friend can say that we have got less. (Hear, hear.) It is unfair; and I cannot have the quantity taken at Greenwich only—it must be taken upon the whole if we would arrive at an accurate result. It was, then, 22¼ per cent. last half year for fuel, and this half year it is but 19½ per cent.; the rest has been saved. Therefore my friend is not accurate. (Hear, hear.)

Mr. BOX: I will pledge myself that I am accurate so far as the accounts at the office can be relied on. (Spoke.)

The CHAIRMAN: I must deny my friend's right to go any further. He has made his speech, and has asked certain questions, which have been answered. I cannot allow him to go further. (Hear, hear.)

Mr. BOX: I must beg leave to be excused, because, if the reply given does not answer to the facts which I——

The CHAIRMAN: You have no right to reply to it.

Mr. BECK: Our friend Box generally takes a gloomy view of affairs, whereas I take a cheerful one. On the present occasion, he seems to think that it shows negligence on the part of the directors that they have not realised as much for their coke as they did in the preceding half year.

Mr. BOX: Do not let us misunderstand each other. I say the chairman stated the truth when he said the loss on this head was rather more than £2500; but I do not complain of that. He has a right to——

The CHAIRMAN: I really cannot allow these comments. (Hear, hear.)

Mr. BECK: I thought I understood Mr. Box to say that more might have been realised for the coke. Now, with regard to this item, no amount of attention on the part of the directors can vary or alter the price—it depends entirely upon consumption and demand; this half year it may sell for 10s. and the next for 5s. Certainly, the directors may by care be able to use less fuel, but that will be but of trifling amount. The items to which I would call the attention of the meeting, and which do depend upon the care of the directors, are "Coals used" and "Rental for light." I observe that, for the corresponding period last year, the cost of coal was £30,456. 14s. 11d., and the rental for light £48,983. 0s. 10d. only; this half year the coals have cost £27,420, and the rental for light has been £53,901; so that you have paid £3000 less for coals, and have increased your rental £4000 this, as compared with the former, period. (Hear, hear.) Now, these are items which are greatly affected by the care of the directors in making their contracts, and in the efforts they put forth to increase the rental. (Hear, hear.) But this is not a certain test. There is one question I should like to ask the chairman, and that is, the quantity of coals carbonised in the corresponding half year of 1855 and the quantity now?

The CHAIRMAN: In 1855 it was 33,437 tons, at 18s. 2d.; this year it is 30,524 tons, at 17s. 11¾d. The one brings out a rental of £48,983, being 160½ per cent. upon the cost of the coals; the other (being the one for the past half-year) shows a rental of £53,901, being 196 per cent. upon the cost of the coals. (Hear, hear.)

Mr. BECK: This is very creditable to the directors. I think in every way the accounts are satisfactory.

Mr. Box again rose to speak, but

The CHAIRMAN said he could not hear any further speech from him on the present motion.

Mr. BOX: My remarks have hitherto been confined to the item of coke; I want now to speak of rental.

The CHAIRMAN: You must not answer other gentlemen. If the meeting is desirous of hearing you, I will listen patiently till eight o'clock, if it be necessary; but this is not business. (Hear, hear.)

Mr. BOX: Holding the stake that I do in the company, I cannot sit down while this matter is undecided. (Interruption.)

The CHAIRMAN: You are not at liberty to speak till this motion is disposed of. (Hear, hear.) You will have another opportunity of speaking on some further motion.

Mr. BAILEY: I think the difficulty arises from the fact that we have not upon the present occasion a statement of the quantity of coals used. Would it be agreeable to the chairman and directors to let us have in our future accounts a statement of the number of tons of coals carbonised?

The CHAIRMAN: I think it would be very injudicious.

Mr. BAILEY: I should like to see it, because then every one would be able to judge of the revenue produced from coals. But for the remark of the chairman just made, I should have proposed that the quantity of coals employed at each station should be given in the accounts.

Mr. BOX again insisted on his right to be heard; but, the feeling in the meeting being very strong against him, he eventually gave way to

Mr. SANGSTER, who said, I do not rise to find fault, but to elicit some explanation. I perceive, from the statement of accounts, that the net profit has been £13,039. 18s. 11d., and that the dividend which the directors propose will require (with the income-tax) £13,419. 8s. 8d.; consequently, there will be £380 paid in the shape of dividend beyond the actual profits for the last half year. In general, we do not divide the whole of the net profits, and I should like to know the reason for departing from that custom on the present occasion.

Mr. HORNER: Had you not better leave that matter till the question of dividend is before the meeting?

Mr. SANGSTER expressed his willingness to do so.

The motion for the adoption of the report was then put and agreed to.

Mr. HORNER said: I rise to perform a duty which is certainly not of the most unpleasant character. It is to propose that you should receive what you have invested your money for, viz., a dividend; and I do it with the more pleasure, because the directors think that they are fully justified in increasing the amount of that dividend beyond what it has been on former occasions. (Hear, hear.) You will, perhaps, have perceived, what Mr. Sangster has referred to, viz., that the amount proposed to be divided will somewhat trench upon our previous undivided balance; but, as we all know that that balance has been retained for the purpose of equalising our dividends. I think we shall all be agreed that it is proper it should be so disposed of; the more so, as the circumstance to which Mr. Box has recently called your attention to is not likely to occur again. (Hear, hear.) The great loss upon our coke account arises from the scarcity of demand for that article, and the great competition there is between the companies to supply it; and this is a matter which, of course, we cannot control, our only true policy being to effect sales as quickly as possible. The accounts of the company being before you, I do not know that it is at all necessary that I should make any remark upon them, except as regards the item for coke, and the

small sum of £400, or thereabouts, which it is proposed to take out of the reserved balance to make up the dividend recommended by the directors; and which balance, you will remember, was increased during the previous half year by £700. I think, considering the great competition to which we are subjected, the low price obtained for gas, and the little reduction we have been able to effect in the cost of coals and other materials required in gas-making, we have done pretty well; because, though house coals have been reduced in price, the cost of gas coal, owing to the competition in the north, has scarcely receded at all. The general opinion is, that coals have fallen to a great extent; but, in reality, it has been scarcely anything. Instead of being 2s. or 3s. per ton, as has been supposed, it has not been reduced more than 1s., and sometimes not more than 6d. The rates of freightage are also extra; and we are informed that, instead of 5s. 6d. or 6s., we shall have to pay not less than we did last half year, which was 30 or 40 per cent. more than it used to be. I mention this because people think that we ought to come down to our former level, which is a perfect mistake. I hope the proprietors will view the exertions of the directors favourably. (Hear, hear.) I think, as a man of business, a more honest account than that which they have laid before you was never presented to any body of proprietors; and therefore, without adding any further remarks, I shall move, "That a dividend for the half year, after the rate of £5. 10s. per centum per annum upon the capital of the company, together with the income-tax, be declared, payable immediately after the business of the meeting has terminated, and afterwards at the company's office at Bankside, on Thursday, the 21st inst., and also on Monday, the 25th inst., from the hour of twelve till three, and from that time, on Wednesdays only, from two till four o'clock."

Mr. RHODES seconded the motion.

Mr. BOX: Am I at liberty to make a few observations at this period?

The CHAIRMAN: Any that fairly arise out of the motion.

Mr. BOX: I do it, not in opposition to the Board—let that be remarked. I believe the directors have paid great attention to our affairs; and that paragraph in the report is strictly true which says, "During the last six months little change in the working of the concern has taken place. Your directors' time and attention have been devoted, as usual, to the manufacture of gas in the most economical manner, with regard both to quality and quantity, and in obtaining materials for the next year's consumption." I have no disposition to quarrel with the report, for I believe it is true; but I think it is quite—I must not say. However, as respects rental, I do assert that the falling off at Greenwich, amounting to £1586, and which I am surprised at, would have given us another half per cent. dividend. I have not touched upon that before; but I say that, whether the price be 5s. or 50s. per ton, it does not affect the question. The quantity of coals used will, or ought to, yield the same quantity of gas at one time as another, whatever the price may be. The price of coals is quite another thing, and will affect your dividend in a very considerable degree indeed. It will also affect the per centage upon revenue, but it will not affect—as the gentleman on my left wished to insinuate—the quantity produced.

Mr. BECK: I said distinctly that it did not; and I asked for the quantity to be stated in the accounts.

Mr. BOX: I understood you to say so, and you spoke about it as though it did; and therefore I was very anxious to meet your remarks at the time. I have said there is a falling off at Greenwich equal to 25¾ per cent. That is a new item, but it is one that I wanted to touch upon when I was on my legs before, had I not felt the unpleasantness of putting myself in opposition to the expressed wishes of the meeting. It is not a private matter of mine; for though, as an auditor, I have arrived at it from the accounts, you may do it without. I believe the directors are worthy of our confidence; and the chairman in particular is deserving of our sincere respect; and therefore I am not putting myself in opposition to the directors. It is as the black man said to his master, "Massa, figures speak;" and my figures speak when I say that at Greenwich there is a loss of £1586 during the last six months.

The CHAIRMAN: May I ask our friend Mr. Box whether he has made all the remarks upon this motion that he wishes to make?

Mr. BOX: I do not oppose the motion, because what I have called your attention to does not affect the dividend. I vote for the dividend, unless you have a mind to increase it. You have written off a very large sum, which, if you had not done, you might have given us a larger dividend. You have written off in respect of "reserve for depreciation on plant and leasehold property" £4229 this half year; the previous half year you wrote off £4259. That is pretty nearly £9000 on the year, and it is not all the depreciation. There is the depreciation upon meters I suppose, which will, I think, make it up to about £10,000 per annum. I think there would have been no impropriety in your writing off less, and giving us a larger dividend.

Mr. SANGSTER again asked for an explanation as to the fact that the directors proposed a dividend which was £380 more than the half-year's profits, instead of reserving some portion of those profits to carry to the "undivided balance account."

Mr. HORNER said: I explained before that this undivided balance has been reserved for the purpose of equalising our dividends; and, as last half year we added to it, the directors felt no hesitation in recommending you now to take a little from it.

Mr. BOX said he thought it was not at all an unreasonable proposition on the part of the directors.

Mr. SANGSTER: That £11,157 is your floating capital?

Mr. PERRY: I apprehend that the £11,157 is reserved from former dividends for the purpose of equalising future ones, and, in some cases, increasing them. I have, in past times, advocated the reservation of a surplus dividend fund, so that the proprietors at large might not be disappointed in receiving their usual dividends at our half-yearly meeting.

The CHAIRMAN: The gentleman who last addressed the meeting has stated exactly what are the facts of the matter. We have a fund consisting of undivided profits, which has been kept not only as a working capital, but really and truly to meet cases of this kind, and equalise our dividends. The directors have gone upon this principle—they have never suggested an increase or alteration of dividend when they had not a reasonable prospect of being able to continue it. (Hear, hear.) They began at 3½ per cent., and they kept to that until they saw that they could give more, with a fair ground for supposing they could abide by it. Then they raised it to 4 per cent., from that to 5, and now to 5½ per cent; because they believe, taking all things into account, they may look forward to be able to do the same in time to come. (Hear, hear.) For though the profits on this occasion are not quite up to it, they think they see their way to meet all demands upon them, and to carry on the works in a satisfactory manner, and at the same time to pay a similar dividend in the future, without trenching upon the reserve fund. (Hear, hear.) Such being the case, they have not felt any hesitation in taking a small amount from that fund this half year, seeing, too, that they added nearly double that amount at the last balance. (Hear, hear.)

Mr. APSLEY PELLATT, M.P.: I am sure we shall have no difference of opinion on the subject of dividend; but I think it is due to the directors that a few observations should be made upon the question of waste, for that is a most important question. Unfortunately, while we have been competing with four or five other companies, and our pipes were interfering with each other, so that sometimes we scarcely knew which were our own, we were suffering an amount of waste equal to 30 per cent. But now, in consequence of having only one set of pipes to deal with, and from the fact that we are paying special attention to them, exchanging them for others when they appear to be of a character not exactly suitable, and from having regard to other matters of detail which I could explain, if necessary, we have reduced our waste to something like one-half that amount. (Hear, hear.) I believe that if you wish clearly to look for the cause of your improved dividend, you must look to this circumstance. I believe, too, that not only may you look to this cause as conducing to your improved financial position, but as reflecting upon the character of your chairman, and directors, and officers, for the great regard they have had to this point in particular. I mention it principally on this ground:—Our consumers may think that they are entitled to a reduction in the price of gas, from the circumstance that we are now in a position to declare a better dividend. Now, that might be a very good argument if the profits had been realised from any considerable reduction in the price of coals; and I believe that, as directors, we should feel that if we could effect a saving in that respect, the public and the consumers would be entitled to the benefit, if it were only to the extent of 2d. per 1000 feet. But, while we are making our saving by attention to matters of detail, by improvements in our varied plans, whether in the erection of immense gasometers, or in whatever means we think it right to lay out our capital, so as to increase the supply and prevent waste, we, and not the public, are fairly entitled to whatever benefit may arise therefrom. (Hear.) I have made these few observations, feeling that they are only just; at the same time that I fully agree with the director of the Chartered Company, that our manufacture of coke has improved. At Christmas we consumed 30,768 tons of coals, and had 24,608 chaldrons of coke for sale; and in the half year ending Midsummer, 1856, we consumed 30,524 tons of coals, and had for sale 24,660 chaldrons of coke. Therefore, I would remind friend Box, that when he comes before a public meeting like this with a statement of apparent facts, he should give himself the trouble to inquire into the details of the matter; and I am sure the chairman of the board, or the secretary, would give him such a statement of the real results as would leave him in no doubt whatever upon the subject, and prevent his misleading (not purposely, I know) the proprietors in the company. I congratulate the meeting that, in regard to the quantity, quality, and price of gas, we have been able to satisfy most fully the expectations of our consumers; and that, with regard to dividend, we have not been disappointed; that our districts have been well looked after; and that no fault has been found with us by the public. (Hear, hear.) Looking back upon the past to see what improvements have been effected, and forward to the future to see what may be done in the improved modes of carbonising, we may fairly anticipate a continuation of at least the same rate of dividend, and also of being able to make a reduction in the price to our customers.

The CHAIRMAN then put the motion, which was carried unanimously.

Mr. RHODES: When is the next call likely to be made? (Laughter.)

The CHAIRMAN: I hope not in my life-time. (Hear, hear.)

Mr. RHODES: I should like to know something respecting the surplus mains in the districts.

The CHAIRMAN: We are going on revising all our mains. We go from street to street, and where once there were three or four small mains, we are taking them up and laying down one large one. In a short time the whole mass of our mains will have been inspected. With regard to service-pipes, we have renewed many miles; and, when we have come to see the faulty state in which many of them are, we cannot wonder at the former amount of leakage.

Mr. RHODES: What is the waste now?

The CHAIRMAN: About 14¾ per cent. (Hear. hear.) Last half year it was 19; before that, 23 or 24; before that 28; and the year before that 31 per cent. (Hear, hear.)

A vote of thanks to the chairman and directors was then adopted, and a similar compliment was also paid to the secretary.

The CHAIRMAN, in acknowledging the favour, said: In behalf of my fellow-directors as well as myself, I beg to thank you very sincerely for your kindness to us on this as on all occasions. It is a source of pride to us to be connected with a body of gentlemen who so uniformly and generously support us in our efforts for the welfare of the company. With such a body of proprietors, it would be excessively ungrateful on the part of the directors if they did not put forth their best energies to promote your success. With reference to the secretary, too, we are delighted to find that you entertain so favourable an opinion of him; and in his absence, and on his behalf, I beg very cordially to thank you. (Hear, hear.)

The proceedings then closed.

WOLVERHAMPTON GAS COMPANY.

An ordinary General Meeting of Proprietors in this Company was held at the Works, Horseley Fields, on Tuesday, August 26, 1856—JOSEPH WALKER, Esq., chairman of the board of directors, in the chair. There were also present—Messrs. W. Savage, J. Cooper, J. S. Rutter, W. Manby, B. Savage, J. Shipton, T. Wade, J. Bradshaw, H. H. Hewlings, G. Cox, R. Wright, John Underhill, T. Wood, J. Ready, and J. Owen.

The CHAIRMAN, having read the advertisement convening the meeting, called upon Mr. Proud, the engineer, to read the report for the half year, which was as follows:—

TO THE PROPRIETORS.

In reporting to you their proceedings for the ninth half year, ending 30th June, 1856, the directors have much satisfaction in stating, that the machinery of the establishment continues to be maintained in a high state of efficiency and working order, and that the steady progress in the improvement of the manufacturing department has been attended by a proportionate increase of profits, which enables the directors still to pay the usual rate of dividend upon the increased capital of the company.

The shareholders are aware that the directors have made a call of 10s. per share, payable on and after the 1st of July ult., which augments the capital in the sum of £2224.

The balance-sheet and general statement of the affairs of the company, duly certified, are now before you; and it will be seen that the income for the half year has been £10,293. 2s., and the expenditure £7139. 1s. 10d—the balance, £3154. 0s. 2d., being the clear profit of the half-year's working; from which sum your directors recommend the payment of a dividend of £2902. 6s. 5d., or 4¼ per cent. upon the paid-up capital—the surplus, £251. 13s. 9d., to be passed to the reserve fund account.

Your directors are now contemplating a reduction in the price of gas, which they hope to be able to accomplish at Christmas next.

During the present season, your directors have been called upon by the lighting committee of the Corporation to make several additions to their mains, for the purpose of increasing the lighting district. These extensions have involved a large outlay of capital, which will be comparatively unremunerative for some time to come, from the fact of their being almost exclusively for the supply of gas to the extra lamps ordered by the lighting committee.

The directors have found it desirable to extend their mains to Wednesfield Heath, a district already partially lighted by the Willenhall Gas Company, whose pipes were originally laid from Willenhall to Wednesfield Heath, to supply gas to the station of

the London and North-Western Railway Company, under contract, for a term of years. Many of the dwellings in the immediate vicinity of the Willenhall Company's pipes have also been lighted, until at length the demand has far exceeded the supply. Your directors having powers in the Act of Incorporation to extend their operations to Wednesfield Heath, deemed it prudent to lay down mains for that purpose without further delay, and accordingly have already lighted several of the parties who were most urgent in soliciting the company to confer upon the district an ample supply of gas.

In conclusion, your directors assure you that they will continue to devote the same amount of attention which they have hitherto done for the protection of the interests and the promotion of the prosperity of the establishment.

The CHAIRNAN then, hoping that the report and statement of accounts were satisfactory to the meeting, moved that they be adopted and entered as minutes.

THOMAS WADE, Esq., seconded the motion, which was carried unanimously.

The CHAIRMAN further moved, that a dividend of 4½ per cent. for the half year be declared on the capital of the company, payable on and after the 3rd of September next; and that the directors be authorised to make up the back dividends to 9½ per cent. at a future time.

Mr. J. COOPER seconded the proposition.

The CHAIRMAN assured the meeting that the directors would not have proposed to do what the latter portion of the resolution set forth unless they had the means.

In answer to Mr. Wood, it was said to be unnecessary to insert the words, "as empowered by act of Parliament," at the end of the motion.

Mr. HEWLINGS asked whether it was proposed to make up the back dividend to 9½ per cent. before the next half-yearly meeting?

Mr. J. COOPER replied, that it was proposed to leave that question in the hands of the directors.

Mr. HEWLINGS thought that, if it was the intention of the directors to do so before the next meeting, it would be advisable to do it now, as it would be more regular to do such an act at a half-yearly meeting.

The motion was then put and carried unanimously.

Mr. J. COOPER moved a vote of thanks to the board of directors for their valuable services during the past half year.

Mr. READY seconded the motion, and it was carried unanimously.

The CHAIRMAN, in returning thanks, said that Mr. Shaw, one of the directors, had, in consequence of infirmity, resigned his seat at the board, and it had been decided to elect Mr. J. Underhill to fill his place. With regard to the vote of thanks, he could not say more than that the directors were as resolute as they had ever been in studying the interests of the shareholders; indeed, while they were studying the interests of the shareholders they were studying their own interests. As the report stated, they had been for some time contemplating a reduction in the price of gas—an alteration which they were very anxious to be enabled to effect. They had a duty to perform towards the shareholders; and when that was done, it was due that the interests of the gas consumers should be considered. Their efforts to effect this would, they hoped, be satisfactory.

The proceedings, which were of a very brief and agreeable character, then terminated.

IMPROVED MODE OF IRON SMELTING.

At the recent meeting of the British Association for the Advancement of Science, Mr. H Bessemer read a valuable paper on a mode of manufacturing malleable iron and steel without fuel. Some experiments which he had made led him to conclude that he could produce a much more intense heat without any furnace or fuel than could be obtained by either of the modifications he had used, and consequently that he should not only avoid the injurious action of mineral fuel on the iron under operation, but that he should at the same time avoid also the expense of the fuel. On this new field of inquiry he set out with the assumption that crude iron contains about 5 per cent. of carbon; that carbon cannot exist at a white heat in the presence of oxygen without uniting therewith and producing combustion; that such combustion would proceed with a rapidity dependant on the amount of surface of carbon exposed; and, lastly, that the temperature which the metal would acquire would be also dependant on the rapidity with which the oxygen and carbon were made to combine together in such a manner that a vast surface should be exposed to their mutual action, in order to produce a temperature hitherto unattainable in our largest furnaces. The mode by which this effect was produced was detailed. The loss in weight of crude iron during its conversion into an ingot of malleable iron was found on a mean of four experiments to be 12½ per cent., to which will have to be added the loss of metal in the finishing rolls. This will make the entire loss probably not less than 18 per cent., instead of about 28 per cent., which is the loss on the present system. A large portion of this metal is, however, recoverable by treating with carbonaceous gases the rich oxides thrown out of the furnace during the boil. These slags are found to contain innumerable small grains of metallic iron, which are mechanically held in suspension in the slags, and may be easily recovered. The masses of iron thus formed will be perfectly free from any admixture of cinder, oxide, or other extraneous matters, and will be far more pure, and in a forwarder state of manufacture, than a pile formed of ordinary puddle bars. And thus it will be seen that by a single process, requiring no manipulation or particular skill, and with only one workman, from three to five tons of crude iron passes into the condition of several piles of malleable iron in from 30 to 35 minutes, with the expenditure of about one-third part the blast now used in a fiery furnace with an equal charge of iron, and with the consumption of no other fuel than is contained in the crude iron. To those who are best acquainted with the nature of fluid iron, it may be a matter of surprise that a blast of cold air forced into melted crude iron is capable of raising its temperature to such a degree as to retain it in a perfect state of fluidity after it has lost all its carbon, and is in the condition of malleable iron, which in the highest heat of our forges only becomes softened into a pasty mass. But such is the excessive temperatere that he was enabled to arrive at with a properly shaped converting vessel, and a judicious distribution of the blast, that he was enabled not only to retain the fluidity of the metal, but to create so much surplus heat as to re-melt the crop ends, ingot runners, and other scrap that is made throughout the process, and thus bring them without labour or fuel into ingots of a quality equal to the rest of the charge of new metal. The facility which the new process affords of making large masses, will enable the nanufacturer to produce bars that on the old mode of working it was impossible to obtain; while, at the same time, it admits of the use of some powerful machinery whereby a great deal of labour will be saved, and the process greatly expedited. One of the most important facts connected with the new system of manufacturing malleable iron is, that all the iron so produced will be of that quality known as charcoal iron; not that any charcoal is used in its manufacture, but because the whole of the processes following the smelting of it are conducted entirely without contact with or the use of any mineral fluid; the iron resulting therefrom will be perfectly free from those injurious properties which that description of fuel never fails to impart to iron that is brought under its influence. At the same time, this system of manufacturing malleable iron offers extraordinary facility for making large shafts, cranks, and other heavy masses. It will be obvious that any weight of metal that can be founded in ordinary cast iron by the means at present at our disposal, may also be founded in molten malleable iron, and be wrought into the forms and shapes required, provided that we increase the size and power of our machinery to the extent necessary to deal with such large masses of metal. At that stage of the process immediately following the boil, the whole of the crude iron has passed into the condition of cast steel of ordinary quality; by the continuation of the process, the steel so produced gradually loses its small remaining portion of carbon, and passes successively from hard to soft steel, and from soft steel to steely iron, and eventually to very soft iron. Once, at a certain period of the process, any quality of metal may be obtained. There is one in particular, which by way of distinction he called semi-steel, being in hardness about midway between ordinary cast steel and soft malleable iron. This metal possesses the advantage of much greater tensile strength than soft iron; it is also more elastic, and does not readily take a permanent set, while it was much harder, and it is not worn or indented so easily as soft iron; at the same time it is not so brittle or hard to work as ordinary cast steel. These qualities render it eminently well adapted to purposes where lightness and strength are specially required, or where there is much wear, as in the case of railway bars, which from their softness and lamellar texture soon become destroyed. The cost of semi-steel will be a fraction less than iron, because the loss of metal that takes place by oxidation in the converting vessel is about 2½ per cent. less than it is with iron; but, as it is a little more difficult to roll, its cost per ton may fairly be considered to be the same as iron; but, as its tensile strength is some 33 or 40 per cent. greater than bar iron, it follows that for most purposes a much less weight of metal may be used; so that, taken in that way, the semi-steel will form a much cheaper metal than any that we are at present acquainted with. The experimental apparatus makes 7 cwt. in 30 minutes, while the ordinary puddling furnace makes only 4½ cwt. in two hours, which is made into six separate balls; while the iugots or blooms are smooth even prisms, 10 inches square by 30 inches in length, weighing about equal to 10 ordinary puddle balls.

The writer of a paper in the *Times* upon this subject says that, "With a view of testing practically this theory, Mr. Bessemer has constructed a cylindrical vessel of three feet in diameter, and five feet in height, somewhat like an ordinary cupola furnace, the interior of which is lined with fire-bricks, and at about two inches from the bottom of it he inserted five tuyere pipes, the nozzles of which are formed of well-burnt fire-clay, the orifice of each tuyere being about three-eighths of an inch in diameter,. At one side of the vessel, about half way up from the bottom, there is a hole made for running in the crude metal, and on the opposite side there is a tap-hole stopped with loam, by which the iron is run out at the end of the process. A vessel is placed so near to the discharge-hole of the blast furnace as to allow the iron to flow along a gutter into it, and a small blast cylinder is used, capable of compressing air to about 8 lb. or 10 lb. to the square inch. A communication having been made between it and the tuyeres, the converting vessel is in a condition to commence the work. The blast being turned on, and the fluid iron run into the vessel, a rapid boiling up of the metal is heard going on within the vessel, the metal being tossed violently about and dashed from side to side, shaking the vessel by the force with which it moves from the throat of the converting vessel. This continues for about fifteen or twenty minutes, during which the oxygen in the atmospheric air combines with the carbon contained in the iron, producing carbonic acid gas, and at the same time evolving a powerful heat. The rapid union of carbon and oxygen adds still further to the temperature of the metal, while the diminished quantity of carbon present allows a part of the oxygen to combine with the iron, which undergoes combustion and is converted into an oxide. At the excessive temperature the metal has now acquired, the oxide, as soon as formed undergoes fusion, and forms a powerful solvent of those earthy bases that are associated with the iron. The violent ebullition going on, mixes most intimately the scoria and metal, every part of which is thus brought into contact with the fluid oxide, which washes and cleanses the metal most thoroughly from the silica and other earthy bases that are combined with the crude iron; while the sulphur and other volatile matters which cling so tenaciously to iron at ordinary temperatures, are driven off, the sulphur combining with the oxygen, and forming sulphurous acid gas. In conducting the demonstration, 6 cwt. 3 qr. 18 lb. of molten iron from a furnace was poured into the fire-brick vessel already described at 12 minutes past 1 o'clock, the blast having been applied at a pressure of about 8 lb. per square inch, and continued until 27 minutes past 1. The mass of metal began to boil up, and the cinders and other impurities were extruded from the top of the vessel by two apertures provided for the purpose. Showers of brilliant sparks were thrown off during this process, which lasted several minutes; and as the object was to produce a mass of cast steel, rather than to continute the process to the extent necessary for making pure iron free from carbon, the vessel was tapped at 36 minutes past 1 o'clock, and the contents drawn off. Small specimen ingots being first taken, the general mass was run into an ingeniously contrived mould concealed in the floor in front of the apparatus, and, after remaining there a few minutes cooling down, it was raised out of the mould in a red-hot state by a hydraulic ram, and placed upon a weighing-machine. The ingot thus produced, with 2 specimen ingots, weighed 6 cwt. Without the aid of fuel, this mass of material was converted, in 24 minutes, from crude cast iron as it comes from the blast furnace into steel of fine quality."

We are informed that preparations are making for trials in the blast furnaces with a view of using the system of smelting, recently patented by Mr. Mickle, of Willmeton, county of Durham. The change that the effectuation of this will make will most probably be the greatest that can occur in the manufacture of iron; and, with Mr. Bessemer's invention in malleable iron, will be the commencement of a new era in this branch of our trade. The benefit arising from Mr. Mickle's improvement as regards the Cleveland stone will be incalculable, and stimulate the opening out of it, and the erection of furnaces, to an extent not at present conceived.

Mr. Mickle, in a circular which he has recently issued, thus describes the nature of his invention:—

"In the present mode of iron smelting there is an enormous proportion of the fuel which the coal contains altogether wasted, and the early adoption of a process to prevent this waste is clearly of much moment to the manufacturer and the community.

"It is proposed, in the first place, to divide the coal by dry distillation, and then use the gas and coke produced as fuel to smelt the ore.

"The coke may be charged as usual, while the gas is conveyed from the gasometer in pipes, and pumped into the furnace.

"The gas-pipe can either be introduced into the air-pipe near the furnace, or the gas itself forced through separate pipes and tuyeres. The former is the more readily effected. At the mouth, the gas-pipe ought to be one-fifth to ½ inch inside diameter, according to quality.

"The heat from the oxy-hydrogen blow-pipe is well-known; it is inferior

only to the solar heat, or to that produced by electricity. It fuses the most refractory substances, and even renders some gaseous.

"The plan infers the use of a blow-pipe; the heat will necessary be most intense, and the fusion of material rapid.

"An eminent ironmaster and scientific chemist considers that one-fifth of the gas would cause his furnaces to yield 50 per cent. more of metal, the gas flame in the upper part of the furnace facilitating the reduction of the hearth; the quality of the iron being also improved.

"Dr. Richardson, of Newcastle-upon-Tyne, a chemist of high standing, expresses an opinion that 'the working of the furnaces would probably be so rapid that the hearth would, within twelve hours, require frequent tapping, yielding a superior quality of iron.'

"The heating of the air-blast may either be continued or not; if continued, it will add to an already extraordinary heat.

"But irrespectively of intensity—

"One lb. of carbon requires for combustion 2⅔ lbs. of oxygen, and 1 lb. of hydrogen, 8 lbs. of oxygen; the heat is in proportion to the oxygen—that is, 1 lb. of hydrogen evolves as much as 3 lbs. of solid carbon; and there are consumed—

1 lb. H. + 8 lbs. O. = 9 lbs.
1 lb. C. + 2⅔ lbs. O. = 3⅔ lbs.

"Charcoal is carbon; coke is a more compact, impure form of carbon.

"From the official report on the coals suited to the steam navy, the average of the analysis of forty-three varieties used in this country gives—

Carbon	82½
Hydrogen	5½
Oxygen	6½
Nitrogen	1½
Sulphur	1½
Ash	3¼
	100

"By dry distillation, as there is no waste, all the carbon and hydrogen are obtained less 1½ of the latter, which combines with the oxygen, &c., or, reckoning carbon into hydrogen, it is equal to 94½ per cent. of the former.

"Whether coke is made in ovens or retorts, it contains the ash, and moisture from cooling, say 3 to 5 per cent.

"It is to be questioned whether coking in ovens yields on an average 60 per cent.; but taking it so, comparing it with the above, and adding ash and moisture to equalise, 94½ + 3½ + say 4 = 101¾; less for tar and hygrometric water, 7¾ = 94; or, in other words, there is obtained from coal equal to 94 per cent. of coke instead of 60.

"Trials in ordinary gas-works give the following results with two different coals:—

3 essays—best coal—nearly 2 cwt. gas per ton of coal.
81½ per cent. strong hard coke, cooled without water, and a little small coke.
86 per cent. strong hard coke, cooled with water, and a little small coke.

4th essay—11,650 feet, or 3 cwt. gas per ton.
75 per cent. large coke, cooled with water.
3 per cent. small coke.
78

2 essays—secondary coal—11,453 ft., or 3 cwts. gas.
75 per cent. strong, hard, large coke.
8 per cent. small (would do for retort fires cooled with water.
83

"From the ovens of the district, 55 to 60 per cent. of coke cooled with water.

"As there has not been inducement, attention has not hitherto been devoted to retort coke, which, from experiment, is capable of being highly improved.

"In smelting, the coal is used either raw or coked; if raw, there is sulphur, and the volatile part of the fuel flies off unconsumed, or partially consumed, with a proportion of the heat of the furnace.

"Where one ton of metal is smelted by	30 cwt. coke.
Water and ash	1½
Net coke	28½

such coal contains of carbon and hydrogen, after allowing for hygrometic water and tar, equal to 95 per cent. of coke—28·5 multiplied by 100, divided by 95 = 30 cwt. coal required.

"The gas-pump can either be fixed horizontally to the blast-engine, or one of 6 or 8-horse power will pump enough for three or four furnaces.

"The fuel of the heating-stoves will be nearly the same as, or more than, that for the retorts and small engine. The capital for gas-works, and the cost of manufacture, equal to, or less than, those for coke ovens.

"Coal gas, purified as ordinarily, will be found the purest fuel since charcoal was abandoned in this country.

"The average cost of fuel may probably be 22s. 6d. to smelt a ton of metal; but supposing 1½ tons of coke be used at 12s.	18s.
Then 1½ tons of coal at 6s. 6d.	
Net cost of carbonising 1s. 6d.	
8s.	12s.
Saving	6s.

"In a large furnace, yielding at present one ton of metal in the hour—

Then 1½ ton of coal, at 9000 feet of gas per ton =	13,500
At 120 oxygen, multiplied by 5 =	81,000
Using 5000 feet of air per minute =	300,000

the gas thus consumes upwards of one-fourth of the air.

"The air required to ensure complete combustion in such a furnace would be about 15 tons; it receives at the above rates 11¼, and thus one-half of the coke passes off as carbonic oxide.

"To prevent explosion, the pressure of the gas should be maintained as high as, or slightly in excess of, that of the air; pressure gauges may be attached to the pipes of both—valves opening only to the furnace placed in the gas pipes—and taps placed as closely into the furnace as possible, and turned off immediately before the engine ceases to pump. Proper attention to the pressure and taps will, from the experiments made, prevent danger.

"It is reasonable to expect that, coupled with purified fuel, the intensity of heat will more effectually separate the iron from the slag, and *vice versâ*; thus improving quality, and besides the saving from economy of fuel, cause the production of a much larger quantity of metal.

"For the development and use of the ore of the lias which traverses England, without coal, from Middlesbro' to the Channel, and which, from the abundant supply it affords, is perhaps the most valuable the country possesses, this invention may be of peculiar value, because it is possible that the concentrated heat of the whole of the gaseous fuel, used in the manner proposed, will reduce the metal so fast as to render the cost for fuel comparatively trifling, and cause a poor ore to yield purer and superior iron.

"There have been 3,000,000 tons made during the year in Great Britain; to smelt this would be required 7,500,000 tons of coal; and of the latter the best and commandable part, upwards of 1,000,000 tons, with 1,500,000 tons of coke, have been altogether rejected and dissipated.

"After it is pointed out, and the way in which it is to be avoided is shown, the system will most likely be changed, and the waste prevented; the results of such change will, in all probability, be reduced expense, better iron, without increase of capital or of charge on any item, except labour; a much larger quantity of metal from every furnace, and more general use, with extended demand and power of supply."—*Northern Daily Express.*

LIVERPOOL.—It is rumoured that Mr. Daniel Horton, who at present fills the situation of meter-prover at the Imperial Gaswork, St. Pancras, will be recommended by the gas committee to the town council as a fit and proper person to be appointed to the new office of meter-inspector to the corporation.

DORCHESTER.—Mr. George Hedley, late of the Sheffield Consumers' Company, has been selected from amongst thirty applicants to be the successor of Mr. Billows, the late manager, who is about proceeding to India.

MADRID.—The Madrid Gas Company, with a view to meeting the claims of its creditors, advertises for sale its manufactory, warehouses, privileges, and other assets. Tenders are to be received on the 15th of September, the minimum reserved price being 18,000,000 reals. A deposit of 3,000,000 reals of nominal capital in the Consolidated Three per Cents., or an equivalent amount of the Deferred Three per Cents., is to be lodged as security.

Price Current.

CASTINGS, per Ton.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	4 15 0	3 15 0	3 15 0	4 0 0	4 0 0
1½ and 2 inches Socket Pipes	8 0 0	7 5 0	7 10 0	7 15 0	7 10 0
2½ and 3 " " "	7 10 0	7 0 0	7 5 0	7 10 0	7 5 0
4 and 5 " " "	7 10 0	6 15 0	7 0 0	7 5 0	7 0 0
6 in. & upwards " "	7 5 0	6 10 0	6 10 0	7 0 0	6 10 0
Retorts, 1st fusion, hot blast	7 0 0	...	7 0 0	7 5 0	7 0 0
" 2nd " cold "	8 0 0	...	7 5 0	7 10 0	7 5 0
Tank Plates, ⅜ thick and above	7 10 0	6 15 0	7 0 0	7 5 0	7 0 0

COALS.

NEWCASTLE. Unscreened.	s.	d.	
Whitwell Primrose	7	0	per ton
Pelton and Medomsley	7	6	"
Pelaw	7	9	"
Burnhope, Eighton Moor, New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	8	0	"
Ramsay's Newcastle Cannel	15	0	"

SCOTCH CANNEL.	per ton.
Boghead, at Leith	32s. 0d.
Kirkness, best	23 0
Capeldrae, 1st quality	20 0
" 2nd "	12 6
Lesmahago, at Glasgow	25 0
" " Leith	27 6
Arniston	22 0
Wemyss	20 0
Knightswood	18 0
Methill	13 0

SUNDRIES.

Best Newcastle fire-bricks . 60s. per 1000.	Welch bar iron, in London . £9 per ton'
" " " clay . . 12s. per ton.	Foreign spelter . . £27. 7s. 6d. "
Cliff's fire-bricks at Wortley, 57s. 6d. p. 1000	English block tin . . . . . £127 "
Tough cake copper . . £107. 10s. per ton.	Banca " " . . . . . £126 "
English pig lead . . . . . £25 "	Tarred rope yarn . . . . . 18s. per cwt.

WROUGHT-IRON TUBING, subject to 35 per cent. Discount.

	2 inches.	1½ inch.	1¼ inch.	1 inch.	¾ inch.	½ inch.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent welded tubes, from 2 to 12 feet, per oot	1 8	1 0	0 10	0 7	0 5	0 4½
" " 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting pieces, or long screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, springs, and elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron cocks	17 6	9 6	7 6	4 6	3 3	2 6
" with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing sockets, caps, plugs, and nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	

FREIGHTS, per Ton.

Coastwise—Newcastle.		*Foreign.*	
Chatham & Roches-	7s. 6d	Boulogne	9s. 0d
Cork [ter	12 0	Barcelona	32 0
Dover	8 0	Bordeaux	19 0
Dublin	12 0	Cadiz	22 0
Exeter Quay	10 0	Calais	9 3
Folkestone	7 6	Dieppe	11 0
Hastings	8 6	Genoa	32 0
London [mouth	8 0	Hamburg	11 3
Lowestoft & Yar-	5 6	Havre	11 9
Lynn	6 0	Leghorn	24 0
Portsmouth	8 6	Lisbon	22 0
Plymouth	9 6	Rotterdam	10 0
Whitstable	7 3	Stettin	15 6
Weymouth	8 6	Trieste & Venice	35 0

FIRE-CLAY RETORTS.

JOHN SWARBRICK,

MANUFACTURER OF PATENT COMPOSITION CLAY RETORTS,

FIRE BRICKS OF EVERY DESCRIPTION, SHAPE, AND SIZE, &c. &c.

HIGHER EANAM, BLACKBURN, LANCASHIRE.

These RETORTS are generally used in the Gas-works of Preston, Accrington, Bury, Heywood, Middleton, Rochdale, Ratcliffe; the Mills of Messrs. Horrocks, Miller, and Co., Preston, &c. &c., and are unequalled in having afforded general satisfaction to those who have given these Retorts a trial.

To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

PRICES MODERATE.

WILLIAM RICHARDSON & CO.,

ENGINEERS, IRONFOUNDERS,

AND

CONTRACTORS

for the Erection, Enlargement, and Repair of

GAS & WATER WORKS,

No. 84, CHARLES-STREET, CITY-ROAD,

LONDON.

WORKS:

Tunnel Foundry and Iron Works, DUDLEY.

KAY'S Patent Equitable Gas-Meter. The attention of Gas Companies is requested to the above Meter as an efficient preventive of fraud by "tilting," so often resorted to by dishonest consumers.

Manufactured only by WM. COWAN, 60, Buceleugh Street, EDINBURGH.

MEAD'S Improved Gas-Meters are constructed of the best materials, the internal parts being of metal capable of resisting the combined agency of gas and water.

MEAD'S PATENT DRY GAS REGULATOR is now used by a great number of gas companies and consumers. It is simple, easily fixed, and when adjusted requires no further attention.

Phœnix Foundry and Gas Apparatus Works, 176, Great Dover Street, Borough, LONDON.

TO GAS COMPANIES, ENGINEERS, AND MERCHANTS.

EDWIN DIXON,

WROUGHT-IRON TUBE WORKS,

WOLVERHAMPTON,

begs with the utmost confidence to solicit the order of Gas Companies, and persons using or selling Gas Tubes. Having for a long period supplied the largest Gas Companies and Consumers in the United Kingdom and the Continent with unvarying approbation, and almost exclusively the Local Boards of Health under Government Engineers, with Galvanised Iron Tubes and Connections, it has become an inducement to make such facts known.

Large Stock always being on hand, orders of any magnitude, from 10 to 100,000 feet, are executed promptly, and carefully tested by powerful hydraulic pressure before leaving the Works.

Boiler Tubes, Core Bars, Hollow Spindles, and Hydraulic Press Pipes, to resist 5000 lb. to the square inch, made on the shortest notice.

The only Prize Medal of the Great Exhibition, 1851, awarded.

PATENT FIRE-CLAY RETORTS.—O. BROTHERS and COMPANY, Manufacturers of O. Brothers's Patent, beg to state that these Retorts, being made in one entire operation, and in one piece, of any required shape, length, breadth, and height, are not liable to cracks and fissures, of which there is a just and general complaint; and consequently superior to, and cheaper than, any hitherto manufactured.

GREAT REDUCTION IN PRICES—30 per cent. cheaper than any other Clay Retorts manufactured.

Shape.	Sizes.	Length.	Thickness.	Price at Railway Station, Blackburn.	Price per foot run, of any required length, at Blackburn.
		feet.	in.	£ s. d.	s. d.
Dee.....	12 in. by 12 in.	8	2½	2 0 0	5 0
,, ...	14 in. by 12 in.	8	2½	2 4 0	5 6
,, ...	16 in. by 13 in.	8	2½	2 10 0	6 3
,, ...	18 in. by 14 in.	8	2½	2 16 0	7 0
,, ...	19 in. by 13 in.	8	2½	2 16 0	7 0
,, ...	20 in. by 14 in.	9	3¼	3 7 6	7 6
,, ...	24 in. by 15 in.	8	2½	3 12 0	9 0
Round.....	15 in. by 15 in.	8	2½	2 10 0	6 3
,, ...	15 in. by 15 in.	10	2½	3 2 6	6 3
,, ...	18 in. by 18 in.	8	2½	3 0 0	7 6
Oval Retort	18 in. by 12 in.	8	2½	3 0 0	7

All other sizes and shapes in proportion, to order. References and further particulars may be obtained on application to the Patentee, Gas Works, BLACKBURN.

WILLIAM PARKINSON AND CO.,

(Successors to the late Samuel Crosley),

COTTAGE LANE, CITY ROAD, LONDON,

Beg to announce that, in addition to the manufacture of GAS METERS, they continue the manufacture of METERS for MEASURING WATER, SPIRITS, &c., commenced, under Patent in 1849, by the late Mr. William Parkinson.

These Meters are as simple and durable as the Gas-Meter, and as correct as that instrument in the registration of the fluids passing through them.

WAILES'S PATENT ECCENTRIC VALVE,

FIG. 1.

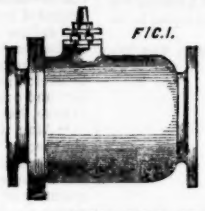
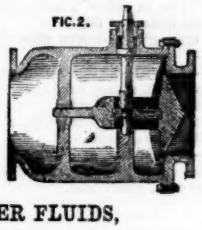


FIG. 2.



FOR GAS, WATER, OR OTHER FLUIDS,

Not to be equalled with regard to Compactness, Simplicity, Non-Liability to Stick, and Economy in Price.

Price, from 9s. to 2s. 6d. per inch diameter.

Further particulars may be had free, on application to WAILES and ROBINSON, Engineers, Founders, &c. 10, Palace Row, New Road, LONDON.

N.B.—Also Manufacturers of the Long and Short Slide and Screw Valves, for Gas and Water. The Long-Slide Valves for Gas kept in stock.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

RETORT AND BOILER SETTING.

FREDERICK SIMMONDS, Sen.,

No. 11, WELLINGTON STREET, OLD FORD ROAD,

Thirty years RETORT SETTER to some of the leading London and Provincial Gas Companies, to whom he can refer, begs leave to draw attention to his economical mode of Setting Clay or Iron Retorts, &c.

F. S. will engage to provide all materials and labour, or labour only.

JUDKIN'S Improved Gas Regulator has the following advantages to recommend it to the consideration of all gas consumers:—1. It can be easily adjusted to supply gas at any required pressure below that of the street. 2. When once adjusted, it will admit of no variation in lights burning, whether they are few or many, whatever the fluctuation of pressure may be. 3. The light being purer by perfect combustion, the atmosphere is more healthy and agreeable. 4. A saving of at least from 25 to 35 per cent. in the consumption of gas is obtained. Its advantages over any other regulator are as follows:—1. It is more simple in its construction. 2. It is more sensitive in its operation, having less friction, as it works only on two steel centres, which are immersed in quicksilver. 3. It is not liable to get out of repair, and requires less attention than a meter itself. N.B.—A Testing Apparatus has been fitted up on the premises of the patentee, 33 and 35, Corporation Street, MANCHESTER; and 98, Fleet Street, LONDON, for the purpose of demonstrating the above facts.

BRYAN DONKIN and CO.'s improved GAS VALVES have been adopted by numerous Gas Companies in England and abroad, and their advantages and great security fully proved. Very large numbers are in use. Prices from 11s. to 14s. per inch diameter. BRYAN DONKIN and Co.,

Engineers, near Grange-road, BERMONDSEY.

VOL. IV. of the JOURNAL of GAS LIGHTING for 1855, is now ready for delivery, price 15s., bound in cloth and lettered. Cloth backs for binding, 2s. 6d. each. A few copies of Vols. II. and III. are also still on sale.

W. B. KING, 11, Bolt Court, Fleet Street.

JAMES NEWTON,

FIRE-BRICK AND TILE MERCHANT,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for

GAS AND WATER WORKS.

PATENT GAS METER MANUFACTORY,

No. 66, Snow-hill, London.

WILLIAM SMITH, by the improvements he has made in the Wet Meter, and which he has secured by her Majesty's Royal Letters Patent, the accuracy of their registry is rendered certain by the introduction of the adjusting slide and hydraulic, whereby a Perfect Water Level is readily obtained, and the Hydraulic precludes the possibility of abstracting water from the meter by increased pressure or otherwise, thus surmounting the great desideratum of the Wet Meter. In his Patent Equitable Gas Meter neatness and strength are combined, the backs and fronts of the case being stamped by powerful machinery out of thick plate iron (tinned or galvanized); and the internal construction is of the best metal, which will resist the action of any impurity in the gas.

Old Meters may readily have the adjusting slide and hydraulic applied, thereby having accurate measurement assured.

Station Meters, Governors, &c., made on the shortest notice.

MR. HENRY GORE,
CIVIL AND CONSULTING GAS ENGINEER.
OFFICE,
25, YORK PLACE, LEEDS.

WEST and GREGSON,
GAS-METER MANUFACTURERS, &c.
UNION-STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

JAMES FEATHERSTONE,
ENGINEER,
Manufacturer of GASHOLDERS, IRON ROOFS, and every description of Gas Apparatus.
ALLIANCE IRON WORKS,
CLAYTON, near MANCHESTER.

JOHN BENT,
MANUFACTURER OF GAS METERS,
283, BELL BAND ROAD,
BIRMINGHAM,
(Established 1830),

Begs respectfully to call the attention of Gas Companies, Engineers, &c., to his WET GAS METER, made upon the most improved principles, the most admirable materials, and warranted to register correctly.

EIGHTON MOOR GAS COALS.—Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

GEORGE CUTLER,
GASHOLDER MAKER,
No. 8, WENLOCK-ROAD, CITY-ROAD,
LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam, and Range Boilers, and Smiths' Work, of the best materials and workmanship.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

ROBERT MACLAREN,
(Successor to Andrew Liddle and Co.,)
IRONFOUNDER AND GAS ENGINEER.

Manufacturer of Patent Iron Tubing, Block Tin, Lead, and Composition Tubing. Cast-iron Gas and Water Pipes of all sizes, and every description of Gas Apparatus.
GLOBE FOUNDRY, GLASGOW.

H. JONES, Gas Meter Manufacturer, No. 41, OLD-STREET, St. Luke's, London, begs respectfully to call the attention of Gas Companies yto his latest improvements in the WET METER, b means of which water cannot be abstracted, neither can Gas by any possibility pass through the Meter without registering.

JAMES PINCHBECK,
GAS METER MANUFACTURER,
26, CAMDEN-STREET, and 9, PIERREPOINT-ROW,
ISLINGTON, LONDON.

Begs respectfully to announce to Gas Companies and Fitters, that from upwards of 20 years' practical experience, he is enabled to supply a METER combining correctness, durability, and economy.

N.B.—Repairs on the lowest scale.

NOTICE.—Mr. N. DEFRIES, Consulting GAS ENGINEER, begs to inform gas companies and the public, that he is desirous of meeting any gentlemen at his WORKS, NEW ROAD, ST. PANCRAS, where, under his own superintendence of the manufacturing department, they will have the fullest opportunity of investigating the many improvements he has recently effected in his ROTARY-VALVE DRY GAS-METER, by which full security will be afforded against leakage and non-registration, even against the searching effects of Cannel Coal Gas. The Rotary-Valve Meter is warranted to register inflexibly correct at a working pressure of half a tenth, and less than a quarter of a foot per hour upon a blue light; and a guarantee will be given to all gas companies to keep it in repair for not less than five years, free of expense. With this meter the gas-supplier may fully depend upon a fair return, and the public upon having a just measurer.

GAS BATHS, GAS COOKING and HEATING STOVES, for all classes. The British Polytechnic Gas-fire, &c. Conservatories and Buildings heated by gas, and perfect ventilation secured.

Any gentleman desirous of consulting Mr. Defries in especial cases, may meet him either at his office, 145, REGENT STREET, or at his residence, 5, FITZROY SQUARE, by giving one day's notice.

Gas-works erected for private houses, where no gas company exists.

By Her Majesty's Royal Letters Patent.

JOSEPH BOULTON,
PATENT DRY GAS-METER MANUFACTURER, and also Maker of his Improved WATER METERS.

No. 28, BAGNIGGE-WELLS-ROAD, CLERKENWELL, adjoining the Police Office.—Late of No. 1, Coppice-row, LONDON.

Experimental and Station Meters of any size made to order on the shortest notice.—Governors, Pressure Registers, Gas-cooking Stoves, and every description of Gas Apparatus.

RUTTER ON GAS LIGHTING.

Hundred and Thirtieth Thousand.
ADVANTAGES
OF
GAS IN PRIVATE HOUSES.
BY J. O. N. RUTTER, F.R.A.S.
A New Edition, Revised in 1855.

Price:—Per 1000 copies, £5; 500 ditto, £2. 15s.; any smaller number, 12s. per 100.

Twenty-sixth Thousand.
GAS IN DWELLING-HOUSES:
ITS USES, CONVENIENCES, AND ECONOMY.

Price:—1000 copies, £3. 3s.; 500 ditto, £1. 15s.; any smaller number, 7s. 6d. per 100.

A single copy of either of the above-mentioned books will be sent, on application to the Author ONLY, by payment of the postage (1d.).

These little books are written in a simple and familiar style; showing the comfort, convenience, safety, and economy of Gas. They are intended for gratuitous distribution by Gas Companies. They have already done good service, and the author is anxious still further to extend their usefulness.

The present high prices of tallow and oil are favourable to a more general adoption of gas in private houses. Let its advantages, as yielding a pure, cheap, and healthful light, be properly explained, and there will be no difficulty in getting over a few old-fashioned prejudices. Those persons who have experienced the benfits of gas-light never go back to candles or lamps.

JOHN W. PARKER AND SON,
WEST STRAND, LONDON.
Black Rock, Brighton.

J. JONES, Iron Merchant, 6, Bank-SIDE, has long been known to sell the following Castings at prices lower than any other house in London:—Socket and Flange Pipes, Bends, Branches and Tees, Syphons, Lamp-posts, Rain-water Pipes, &c.; also, Hot Water Pipes, Elbows, Tees, Cylindrical and Saddle Boilers, and every Fitting for the same. Drawings and Prices of the above on application to J. JONES, Iron Bridge Wharf, 6, BANKSIDE, near the Southwark Iron Bridge.

ARTIFICIAL Hydraulic or Portland CEMENT, for Brickwork, Concrete, Plastering, &c., combines the valuable qualities of the natural Cements, with the additional advantage that it greatly excels them in its cementitious properties; that it is not affected by frost, and does not vegetate in damp situations. Account of COMPARATIVE EXPERIMENTS on the strength of this and other Cements (read at the Institute of Civil Engineers) to be obtained from the Makers, JOHN BAZLEY WHITE and BROTHERS, Millbank Street, WESTMINSTER, who prepare one quality only of Portland Cement.

SHEARS AND SONS'
PATENT DRY GAS METERS
Are supplied to Gas Companies and the Public as the best and simplest Dry Gas Meters in use. They are acknowledged to be of first-rate workmanship and accuracy of registration.—Shears and Sons continue to supply these Meters on the most favourable terms; and they also manufacture Wet Gas Meters, to which they apply heir Patent Indices.
BANKSIDE, LONDON.

PADDON AND FORD,
PATENT GAS METER & APPARATUS WORKS,
GRAY'S-INN-ROAD, LONDON,
Manufacturers of WET and DRY GAS METERS, STATION METERS, GOVERNORS, EXPERIMENTAL APPARATUS, GAS STOVES, and LANTERNS.

Contractors for the erection or alteration of Gas Works; and every description of Apparatus required in Gas Works supplied.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

WHITEHOUSE and CO.,
GLOBE PATENT TUBE WORKS,
WEDNESBURY,

Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

WHITWELL PRIMROSE GAS COAL.—These excellent Gas Coals can be shipped either at the South Dock, SUNDERLAND; or Old Harbour, HARTLEPOOL; or Brandling Drops, SOUTH SHIELDS; on application to the WHITWELL COAL COMPANY, Sunderland.

ANDERSON'S
DOUBLE-ACTING PISTON EXHAUSTER
is the most simple and effective machine of the kind made. It gives no appreciable oscillation or slip; works with extremely little friction; and requires no internal lubrication.

These Exhausters are in operation both in London and the Provinces, pumping from 10,000 to 70,000 cubic feet of gas per hour. They occupy very little space, and may be set either perpendicular or horizontal.

Particulars of price, &c., may be had on application to Mr. ANDERSON, at the Gas Works, Rotherhithe LONDON.

FIRST PRIZE IN THE PARIS EXHIBITION.
GAS EXPLOSIONS PREVENTED by using the Tubes and Fittings Manufactured by
JOHN RUSSELL and CO.,
whose Goods are all well Tested and Warranted.

Inventors and first manufacturers of Lap-welded Flues for Locomotive and Marine Boilers.

John Russell and Co. are the Original Manufacturers, and at present the Holders, of the Patent for Tubes.

WAREHOUSES,
69, UPPER THAMES STREET, LONDON.
MANUFACTORY,
THE OLD TUBE WORKS, CHURCH HILL,
WEDNESBURY, STAFFORDSHIRE.

PATENT FLEXIBLE GAS TUBING.
JAMES LYNE HANCOCK'S Vulcanized Indiarubber Hose Pipes and Tubing. Manufactory (and Warehouze), Goswell-mews, Goswell-road, London.

Gas Companies, Engineers, Gas Fitters, and the Trade generally, are respectfully informed this Tubing is now manufactured to any size, from ¼ inch bore and upwards, in 100-feet lengths, and perfectly cylindrical, either with or without a spiral wire inside.

VULCANIZED GLAZED FLEXIBLE TUBING, from ¼ inch up to 1 inch diameter, made in 24-feet lengths; or, covered with silk or worsted, up to 100 feet.

VULCANIZED HOSE, for FIRE ENGINES, BREWERS' USE, and for standing great pressures, (Rubber and Cloth combined), made to any length or size to fit the necessary screws, &c.

VULCANIZED INDIARUBBER AIR-TIGHT BAGS, made any size, for Gas Mains, with flexible tubes attached, and fitted with stopcocks complete.

WALTER MABON, Engineer,
ARDWICK IRON WORKS, FAIRFIELD STREET,
MANCHESTER,
Manufacturer of

IRON TANKS for Gasholders, Railway Stations, &c.

GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.

GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.

WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.

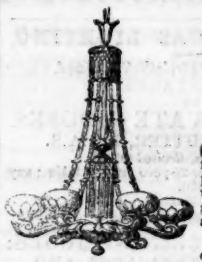
IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.

PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

ALEXANDER WRIGHT,

GAS ENGINEER, MANUFACTURER OF GAS-METERS, GOVERNORS, AND EVERY DESCRIPTION OF GAS APPARATUS,
55, MILLBANK STREET, WESTMINSTER.
CONSUMERS' METERS at the List Price, with a Liberal Discount to Wholesale Purchasers.
THOMPSON'S BROMINE TEST, £1. 1s.—BROMINE, 3s. per Ounce.
BISULPHURET OF CARBON TEST, £2. 2s.,
APPARATUS FOR DETERMINING THE HEATING POWER OF SAMPLES OF COAL AND OTHER DESCRIPTIONS OF FUEL, £5. 5.,
INVENTED BY LEWIS THOMPSON, ESQ., M.R.C.S.
REGISTERING PRESSURE GAUGE, Net Price, £8. Glass Shade, 10s. extra.
STATION METERS, PRESSURE GAUGES, PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, &c.

JAMES MILNE & SON,
GAS ENGINEERS & BRASSFOUNDERS,
MILTON HOUSE,
EDINBURGH,
Manufacturers of Consumers' Gas Meters in Tin-plate and Cast-iron Cases; Station Meters, Governors, Patent Gas Regulators, Chandeliers, Glass Lustres, Burners, and Gas-fittings of every description.
PLANS AND TENDERS FOR GAS-WORKS.
James Milne and Son request the attention of Gas Companies to their Meters in Cast-iron Cases, which have been very extensively used during the last 35 years, and continue to give universal satisfaction.
Their Town Warehouse is now removed from 38, Ludgate Hill to
No. 1, CRESCENT, NEW BRIDGE STREET, BLACKFRIARS, LONDON.



F. & C. OSLER,
44, OXFORD-STREET, LONDON;
Manufactory—Broad-street, Birmingham,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.
ELEGANT CRYSTAL GLASS CHANDELIERS, FOR GAS
(Made rom "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.
THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

TO GAS COMPANIES, GAS PROPRIETORS, AND GAS ENGINEERS.

JOHN VICKARY

begs to call the attention of the above to his improved METALLIC CASE GAS-METER, an improvement which has met with entire approbation from the various Gas Companies and Engineers to whom he has introduced it, and acknowledged to be the greatest improvement that has been made since the year 1832; at which period a metal was introduced for the construction of the Drum, Syphon, and Float, capable of resisting any impurities arising from either gas or water, which has been found to answer every expectation; as, in repair, Drums of the above date are found in perfect and good condition, when the Outer Case, Valve-box, Inlet-pipe, &c., are quite destroyed and entirely past repair.

J. V. has introduced a coating or lining of the above metal in the Outer Case, Valve-box, Inlet-pipe, &c., thereby rendering the whole as durable as the Drum, as not a particle of tin plate is exposed to the action of either water or gas; and preventing the possibility of gas passing above the water line through the front into the body of the Case to the outlet unregistered, which frequently occurs. When the Meter has been in use for any length of time it is generally found that rust or decay takes place *above* rather than under the water line, which is only discovered when they need repair. Also the Inlet-pipe and Valve-box are generally found quite decayed, which cannot happen in the above improvement.

J. V. feels confident that the above will be found a most desirable and perfect instrument, as it contains all other improvements of utility that have been introduced up to the present time.

The most strict attention is given to the workmanship as well as the registration of every Meter, to render them perfectly accurate.

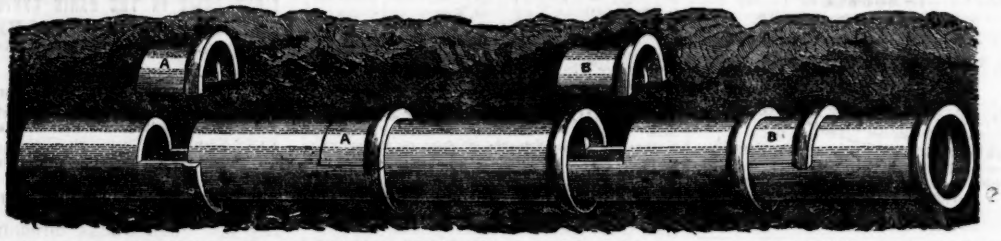
Station Meters, Governors, &c., made on the shortest notice, as well as Gas Cooking Apparatus of every description, Gas Baths, &c.

Meters sent at the lowest London prices.

Carriage paid to any part of England.

WEST OF ENGLAND GAS METER AND GENERAL GAS APPARATUS MANUFACTORY, 84, FORE STREET, EXETER.

AYLESFORD POTTERY COMPANY'S PATENT DRAIN-PIPES.



The above Company respectfully invites the attention of Engineers, Architects, Surveyors, Builders, &c., to an improved DRAIN-PIPE, whereby all stoppages may be cleared without disturbing the invert of the drain, by simply removing the cover (marked A or B), whichever may be preferred.

The cover (marked B) may be used in conjunction with whole or half Socket-Pipes.

Pipes thus constructed may be laid at intervals in a drain of ordinary Socket-Pipes.

With the great advantage these Pipes offer, they are cheaper than any yet submitted to the public.

London Depot—AYLESFORD WHARF, Belvedere Road, Lambeth.
MANUFACTORY AT AYLESFORD, NEAR MAIDSTONE, KENT.

TO GAS COMPANIES, FITTERS, AND IRONMONGERS.

LLOYD and SUMMERFIELD,
Manufacturers of CUT and FLINT GLASS Jet Moons, Globes, Hemispheres, and Chimneys of every description; Hall Lamps, Lustres, and Chandeliers of the most modern patterns.
PARK GLASS WORKS, BIRMINGHAM.

R. LAIDLAW AND SON,
GAS ENGINEERS AND FOUNDERS,
GLASGOW,
Makers of every description of APPARATUS for the MANUFACTURE and DISTRIBUTION of GAS.
CONTRACTS ON THE LARGEST SCALE.
LONDON OFFICES: 8, LONDON STREET, CITY.

JOHN BRYAN,
GENERAL COMMISSION AGENT,
1, SANDHILL,
NEWCASTLE-ON-TYNE.
Contracts made for all kinds of Cast and Wrought Iron Gas and Water Apparatus, Clay Retorts, Fire-Bricks, Coals, &c.—Prices, and Lists of Freights and Carriage, sent on application.

HULETT AND CO., 55 AND 56, HIGH HOLBORN,

PATENTEES and MANUFACTURERS of the NATIONAL GAS METER,

Beg to inform the Proprietors of Gas Companies, and the Trade generally, that, having completed their new Gas Meter Manufactory, they are now enabled to supply, with despatch, a very superior article, and can confidently warrant the same to be equal in quality and workmanship to any Gas Meter ever made. Manufacturers of

GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, PILLARS, BRACKETS, PENDANTS,
AND EVERY ARTICLE CONNECTED WITH
GAS FITTINGS.
GAS COOKING APPARATUS, IMPROVED ALBERT,
AND EVERY DESCRIPTION OF
SHADOWLESS GAS BURNERS, UNION JETS, BATSWINGS, &c. &c.; CAST AND WROUGHT IRON PIPE;
COPPER, TIN, BRASS, and COMPOSITION TUBING.

D. HULETT'S IMPROVED SERVICE CLEANSER,
by which Mains, Service Pipes, and the interior Fittings of a House, may be cleaned out in a few minutes. Price 60s. net.

Sole Manufacturers of Church and Mann's Improved Photometer.

Large Pattern Books, with every description of Gas Fittings and Chandeliers, &c., with complete Book of Prices, price 10s.
Price Lists sent free, on receipt of envelope, addressed and enclosing two postage stamps.

London: Printed by THOMAS GREAVES BARLOW, of 3, Parliament Street, in the parish of St. Margaret, Westminster (at the office of Joseph Clayton, 10, Crane Court Fleet Street); and published by WILLIAM BOUGHTON KING, of No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Sept. 2, 1856.